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Radio Fun

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"The beginner's guide to the exciting world of amateur radio."

in this issue

FAIRS DXpedition: Building Global Friendship

Helen Goncharsky RB5Wa/KBØKNC made our first DXpedition contact using S21ZH, which was issued to Gaynell Larsen KD4GMV.

"Building Global Friendship" is the purpose of the Foundation for Amateur International Radio Service (FAIRS), and this is just what a team of eight members did in Bangladesh during March 1993. A group of FAIRS members from the USA, Ukraine, and Russia met in Dhaka to provide training for prospective amateurs from February 27 through March 17, 1993. The team consisted of: David Larsen KK4WW/UB5WUS/S21ZJ (Executive Director, FAIRS/Expedition Leader, Instructor, Volunteer Examiner), Gaynell Larsen KD4GMV/UB5WMV/S21ZH (Vice Director, FAIRS/Team Coordinator, Larry Vogt BV/N4VA/S21ZK (FAIRS Training Director, ITU Region 3/Instructor, Volunteer Examiner), Victor Goncharsky UB5WE/KC1VF/S21IZM) FAIRS European Operations Director/Chief of DXpedition Team), Helen Goncharsky RB5WA/KBØKNC/S21MZM (2nd Op.) (FAIRS Europe Secretary/DXpedition Team Operator), Yuri Katyutin UA4LCQ/KD4STR/S21ZL (Director of Operations, FAIRS Russia/DXpedition Team Operator), Serge Tarasov UA4LLQ/KD4QAU/S21ZL (2nd op.) (FAIRS Member, Russia/DXpedition Engineer and Operator Representative), an Vyacheslav Sergeev (Vice Rector Ulyanovsk Polytechnical Institute, Russia/CIS Team Sponsor/FAIRS Member Russia).

The FAIRS representatives were able to obtain five amateur licenses from the Bangladesh government and installed three stations at different locations around Dhaka. Two stations were used to provide QSOs during the period, while the third position provided training (including "hands-on" experience) for the students. A few of the students were lucky enough to also get to learn about antenna installation in the 32-degree (centigrade) heat!

All five callsigns were used during 11 "working" days to overcome the "seven-day-per-license" situation. The total score was more than 25,000 QSOs on all amateur bands except 160 meters (unfortunately, there wasn't space for a top-band antenna in the urban area).

Continued on page 15

Amateur radio brings the world to rural schools in Spain. See page 9.

The School-To-School QSO Contest

Patrick Lehrman N9JPV and the Westmont (Illinois) Amateur Radio Club are working on starting a contest with a little more purpose than merely getting a signal report from some unknown callsign. Through this program, called the School-To-School QSO Contest, Patrick hopes to achieve three main goals: 1) Introduce many young people to amateur radio; 2) Foster learning and understanding among students across the country and around the world; 3) Put the privileges of an amateur radio license to practical use.

The School-To-School QSO Contest will be held from 1200 UTC on October 5, 1993, and will run for 24 consecutive hours, until 1200 on October 6. Amateurs and clubs should contact a school to arrange to set up a contest station. The idea is to act as a control operator so that, where allowable, the students can actually communicate with each other.

The score for each contact is figured by: Mode Point x Technique Point x Multiplier. For the Mode point, CW is worth 1; RTTY, packet or other digital modes is worth 2 points; and voice or SSTV contact is worth 3 points. For the Technique Point, HF or repeater contacts are worth 1, satellite communications are worth 3, and a moonbounce QSO is worth 10 points. The Bonus Multipliers are 2 for a third party foreign QSO, 3 for a school-to-school QSO, and 3 for any QSO with a station in Africa or Antarctica. Student amateurs operating a school station will receive 10 bonus points. Everyone who participates will be awarded a certificate, and the winning station will be given a plaque pro-

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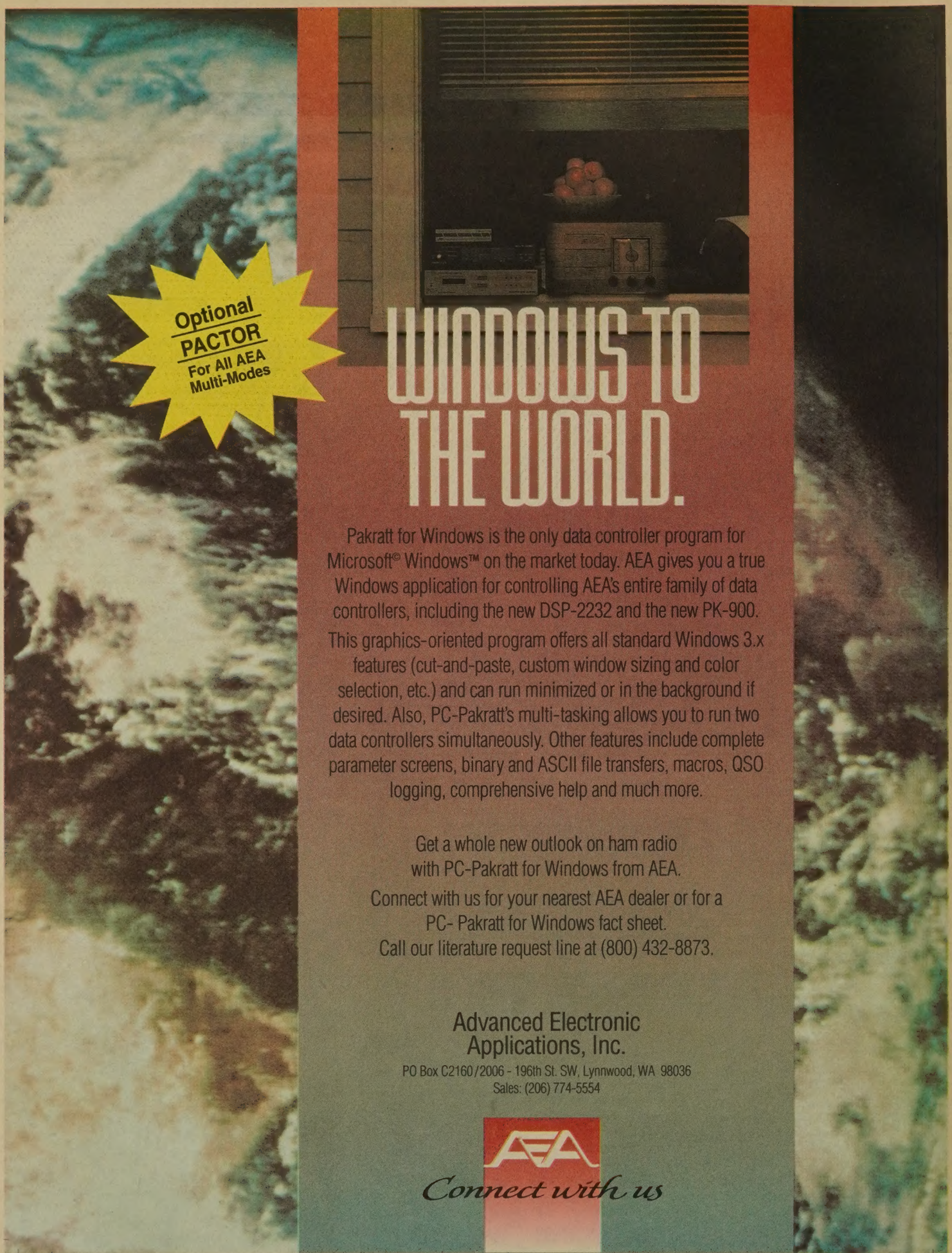

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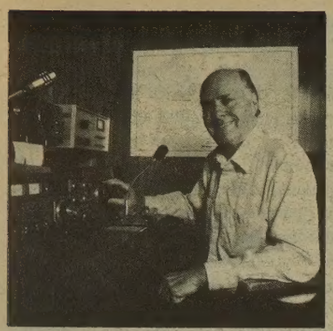

QLF

by Wayne Green W2NSD/1

What About CW?

I got a fax from a ham who has designed an IC chip to convert CW into ASCII. His question was, should he have them fabricated and go into business selling 'em? What would you answer?

At first it sounds like an interesting proposition. Sure, there are several pieces of equipment on the market designed to do the same thing, but by putting the whole circuit on one chip he should be able to get the price down, making it very competitive. But I don't tend to think in those terms when it comes to considering a new product to market. I ask who the potential customers are and how many of them there are. I then ask what are the benefits these customers would get from the product.

Almost the only use of CW these days is by radio amateurs so there isn't much other than ham transmissions to copy, therefore it's unlikely the chip would be of interest to the manufacturers of all-band receivers and transceivers. Recent studies have shown that a large percentage of CW operators are already using commercial converters or their computers to read the code. Some are using a keyboard to generate the CW and some are using hand or automatic keys.

Almost all rigs made these days are primarily for sideband use, though most of them can still be used for CW. When I started in amateur radio back in the '30s, 80% of all contacts were CW. Today that's more on the order of 10%. Do a count some Saturday afternoon and see how many CW and SSB contacts you hear in progress, starting with 160m and going on up through 10m. If you include 2m, it's even worse.

The chaps using CW without computer help are doing it because they enjoy copying code, so they wouldn't be likely customers for a chip. Those on CW with computers tend to be using them for both transmitting and receiving, so the chip wouldn't help them much either.

Despite the belief to the contrary, bordering on the religious by many old-timers, our no-code newcomers *have* been busy learning the code so they can upgrade and get in on the fun. I'm hearing that from every part of the country. So much for the doom and gloomers. But I'm not hearing anything about their enjoying the code-learning experience. Perhaps some of them suffer from the same psychological problem I do and are resentful because they believe they have been forced to do something of little relevance in today's communications world. They look on it as being similar to having to prove they can crank-start a Model T in order to get a license to drive an automatic shift car.

If the code had been voluntary, I'm sure I'd have loved it and gotten good at it. I've found I can do anything I put my mind to. But it was mandatory, so I refused to use it unless there was absolutely no alternative.

as will TV broadcasters. That means that amateur radio will have to go digital. I can remember when amateur radio led in new modes and technologies.

Back in 1948 I was in the right place at the right time to help pioneer narrowband FM. This was being promoted by Jack Babkes W2GDG, who lived just a few blocks from me. After visiting and talking with Jack I got excited about the idea and quickly built NBFM modulators into my VFOs and turned off my AM amplifiers. It made it a lot easier to take my kilowatt rig along in the back seat of my car when I got a job in Florida. Jack got NBFM accepted by the FCC and then started Sonar Radio to capitalize on it. Today virtually all VHF communications uses his NBFM.

I also helped pioneer RTTY, SSB, SSTV, OSCAR, repeaters, and so on. I'll tell you about those exciting times one of these months. Every one of those was an adventure.

"With so many new communication modes on the horizon, I hate to see old-timers with their heels dug in over the code, fighting a losing and dumb battle over a mode which has little relevance today."

With so many new communication modes on the horizon, I hate to see old-timers with their heels dug in over the code, fighting a losing and dumb battle over a mode which has little relevance today. It was fine in the 1930s when we had few phone frequencies and phone rigs tended to be expensive.

The whole broadcasting world is going digital and here we are fighting about CW. Radio stations will all be converting to digital audio,

So no, I don't see much of a need for a Morse-to-ASCII chip. Let's keep CW for those who enjoy the excitement of copying code. I'm not sure there are any benefits to using computers for high speed Morse when packet radio is so much more error-free. And that goes for RTTY too. Yes, we do need to develop faster packet systems and more error-free high frequency packet. RF

Using Radio for Navigation

by Roald Steen AJØN/LA6US

Radio is important not only for communications, but also for navigation. Its usefulness for navigation was realized very soon after its invention. In the early radio navigation systems, directional antennas, especially the loop antenna, were used to determine the bearing to a radio transmitter. Using triangulation, the location of a vessel or an aircraft can be determined by taking the bearing to two or more radio transmitters when their locations are known.

The first radar experiments took place before World War II, and many early radio experiments took place near the HF bands. The radar system which England built to detect aircraft at the beginning of the war used frequencies near the 10 meter amateur radio band. This radar system proved invaluable during the Battle of Britain.

Radar became a widely used civilian navigation system following World War II. Modern radar relies on microwave radio frequencies.

Two modern radio navigation systems that are widely used are Loran C and the GPS (Global Positioning Satellite) navigation systems. Loran C is somewhat less accurate than GPS, but is widely used because a Loran C receiver costs less than a GPS receiver. While North America and Europe are well-equipped with Loran C facilities, there are many other parts of the world without coverage by these systems. The coverage of the GPS navigation system is worldwide.

Loran C

The Loran C system in the United States is composed of a number of Loran C chains. Each chain consists of one primary Loran C transmitter station and several secondary transmitters.

A Loran C radio signal is transmitted from the primary station and is retransmitted from each of the secondary stations, with a fixed delay. The transmission at the secondary stations used to be triggered by the signal transmitted from the primary station, but today accurate atomic clocks are used by the secondary stations to trigger their transmissions without input from the primary station.

A Loran C receiver detects the difference in the arrival of the signal from the primary Loran C station and the secondary Loran C station at the Loran C receiver. The time difference in microseconds enables the microprocessor in the Loran C receiver to place itself somewhere on a hyperbolic Line of Position (LOP).

A radio location system which tells you that you are somewhere on a hyperbolic LOP, but which cannot tell you exactly where you are on that LOP, is not satisfactory for most navigators. The Loran C receiver solves this problem by also measuring the time difference between the arrival of the signal from the primary Loran C station and from a *second* secondary Loran C station. This information generates a second hyperbolic LOP. The receiving station must be somewhere along this LOP, and this information gives the Loran C receiver enough information to determine its exact location: the point where the two hyperbolic LOPs intersect.

When Loran was a new radio navigation system, the user had to use a map with the LOPs printed on it like a grid in order to find his or her position. This method might have been useful for a highly-trained navigator aboard a slow-moving vessel out at sea, but it left a lot to be desired for most other users.

In modern Loran C receivers a microprocessor does this work. Stored in the microprocessor's memory is information about all of the Loran C chains around the world. From the Loran C signal, it automatically decodes the receiver's location in longitude and latitude. In fact, most Loran C receivers are now capable of doing a whole lot more than just providing your location. For example, your speed and direction can be determined by the microprocessor as it detects how your location changes with time.

As well as providing location in longitude and latitude, many modern Loran C receivers are capable of displaying navigational information in other ways which may be more convenient for the user, such as in the form of waypoints and distance and direction to each waypoint. From its estimate of speed and direction of movement, the microprocessor may also provide an estimate of the time of arrival at your destination, or of the duration of your trip or voyage.

All Loran C transmitters transmit on the same frequency, 100 kilocycles. Through a time division system, nearby Loran C chains are prevented from interfering with each other when they are transmitting.

A Loran C signal is composed of pulses, and each Loran C chain is identified through a delay between some of these pulses. This delay, which is called the Group Repetition Interval (GRI), is utilized by the Loran receiver to determine which Loran C transmitter it is receiving. The 89,700 microsecond delay which identifies the Great Lakes chain can thus be called GRI 8970. The 99,400 microsecond delay in the U.S. West Coast Chain is called GRI 9940. The radio transmitters which compose a Loran C chain use very accurate atomic clocks to keep the delay intervals accurate.

The Loran C system in the United States is operated by the United States Coast Guard. Since Loran C was constructed as a navigation aid for shipping, for a long time it mainly covered the areas near the Coasts and the Great Lakes. However, two additional Loran C chains have recently been put into service in order to have the entire contiguous United States covered. One of the two new Loran C chains is operated in cooperation with Canadian authorities because it includes a secondary station in British Colombia.

Outside of North America, Loran C covers much of the North Atlantic and the coasts of Europe and the Far East. The Gulf of Mexico is well covered, but Loran C coverage is poor in the Caribbean south of the Bahamas. There is little Loran C coverage of the Southern Hemisphere.

GPS

With a GPS receiver, exact location can be determined within less than 300 feet. In contrast to Loran C, GPS is a three-dimensional navigation system. This makes GPS a very useful navigation system for the aviation industry because, in addition to longitude

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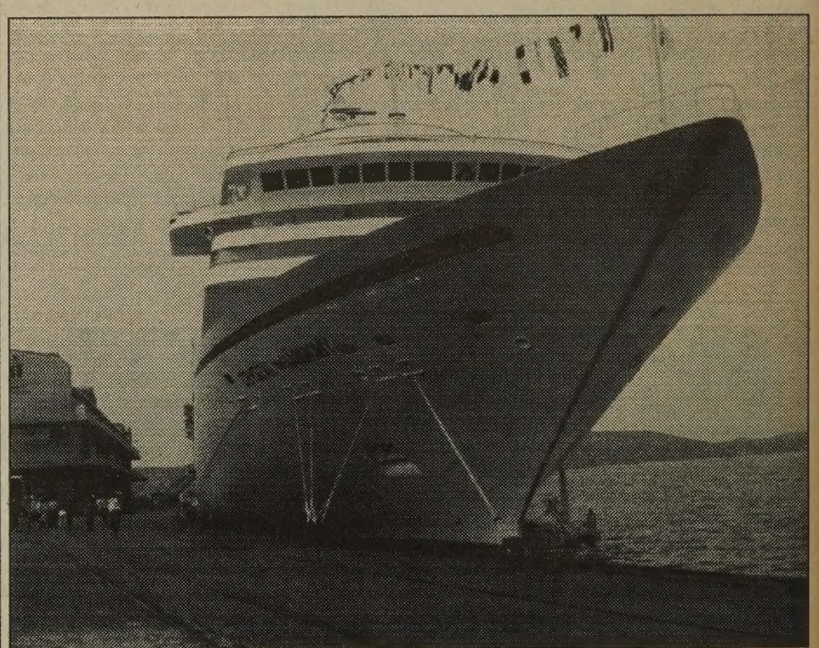

Photo A. The navigators aboard this modern cruise ship have access to a variety of radio navigation systems.

Photo B. While Loran C is not authorized as a primary navigation system in aviation, it is widely used as a secondary navigation system in small aircraft.

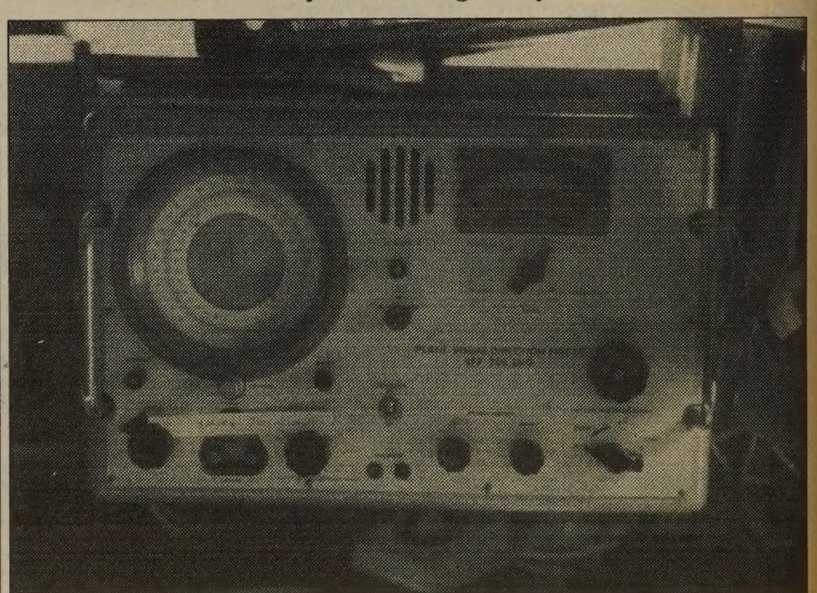

Photo C. Shipboard radio direction finder. This radio navigation system is still a compulsory part of the radio equipment aboard large vessels.

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letters

Write to: Radio Fun, 70 Route 202-N, Peterborough, NH 03458

Jim Corbitt WA4FLM, Bay Minette AL Not too long ago I was tuning around on 20 meters and heard a fellow ham calling CQ. He made it clear that there were visitors in his shack and he was intending to give them some exposure to this wonderful hobby of ours. Before I could tune up, another ham beat me to the draw and I was very disappointed at what I heard. You would think that if there is ever a time to refrain from using such amateur-specific terms as QTH, QRM, Handle, 5/9, etc. surely it's when non-hams are present. Anyway, the guy who answered the call began the usual boring routine of giving his report.

I tried to imagine myself in that poor guy's shoes, having to interpret every other word to his visitors. I suspect that they quickly got bored just trying to figure out what the hell these "hams" were talking about.

For the sake of visitors (and the poor guy trying to decipher), would it not have been more appropriate to talk in plain English? For some reason, this seems to be a pervasive problem in our hobby. I've had the same thing happen to me many times during my 31 years of hamming. It can be very frustrating. I hope every ham in the country reads this and can gain some appreciation for what I'm saying. It would be comforting to know that the next time I call CQ and indicate that I'm trying to demonstrate our hobby to a few visitors, I will get a response from someone who will use common sense and talk so my company can understand what's going on.

Jim—People who overdo it on CW shorthand when they're using voice are "lids," even when their "QSO" with another "OM" does not have "XYLs," "harmonics" or other visitors "reading the mail." You make an excellent point.—David N1GPH

David L. Lockard N3LZI, Mount Joy PA As a teenager, a friend of mine (Rick Clark WA3GSL, now KC3DR) would listen to the radio on an old Hallicrafters receiver of his dad's. We would camp out in his back yard and go into his basement and listen to the traffic. My friend went on to obtain his license, but I lacked the equipment to hear the code and could not seem to learn it on my own.

I maintained an interest in radio over the last 30 years but tried to suppress it partly because of the expense, but mostly because I never passed the code and did not obtain a license. Playing with audio electronics didn't do much for me.

From time to time ham radio would come back to coax again. My youngest daughter was born on January 20, 1978, in an 18" snowstorm. I called the Township and asked if they could send a snowplow to clear a way for me to follow to the hospital because my wife was in labor. They told me that they had no way of communicating with the plows but they would send an ambulance. I told them that it was no use sending those low-bodied vehicles because what was needed was something with some clearance.

As it turned out, my ham radio friend drove up in front of my house in an old Plymouth (195?) with chains on. He told me that he had heard we were having a baby today. I told him we were waiting for transportation to the hospital, at which time he informed me that he was it. He was doing volunteer work for the county emergency management, transporting nurses, etc., to the hospitals.

It took us two hours to make the 10-mile trip and my daughter was born a half hour after our arrival. We made slow but steady progress and stayed in contact by 2 meters throughout the trip. Had we become stuck they were going to send a helicopter or snowmobiles.

I again tried to suppress my interest in ham radio, but then came the no-code exam. Last year I obtained my license as a Tech Light and upgraded to a Tech Plus a few months later. It's amazing what incentive the Tech Light license provided. I have since passed the General theory and am ready for the Extra but am still struggling with 13 wpm code.

My interest in radio sparked other interests as well. I am self-employed, providing technical and testing services to municipalities in my area. I had worked for an engineering firm for 16 years and used electronics distance measuring, fathometers, lasers and other neat electronic and mechanical tools involved in surveying.

My interest in radio has now come to life, thanks to the no-code license, and I plan to expand into the hobby much further. RF

Using Radio for Navigation

Continued from page 4

and latitude, the altitude of an aircraft can be determined.

GPS is composed of a system of satellites that operate in 10,000-mile-high orbits. A few of these satellites are not in orbit as this is written. Space launch schedules, which often are subject to delays, will determine when all of the GPS satellites are in place.

At the core of the GPS system is an extremely accurate clock aboard each satellite. A GPS receiver does not have to include as accurate a timing device since it is able to cancel out timing errors when it is receiving several satellites at once. To provide accurate position information in three dimensions, the GPS satellite receiver needs to be able to observe four satellites simultaneously.

The operation of the GPS system is based on advanced algebra. There are four potential sources of error for a GPS receiver. These errors are related to radio propagation, timing and satellite position. Since there are four sources of errors, four equations supply the solution to all of these errors to the microprocessor in the GPS receiver. These four equations are obtained by observing four different satellites simultaneously.

Until the GPS system is complete, there will be times when a receiver will be unable to receive four satellites simultaneously. However, for the GPS user on the surface who does not need to know his or her altitude, only the longitude and latitude, the GPS system is already covering our planet well. There are many GPS receivers on the market that will supply more information than simply longitude and latitude; this includes speed, estimated time of arrival, and time underway.

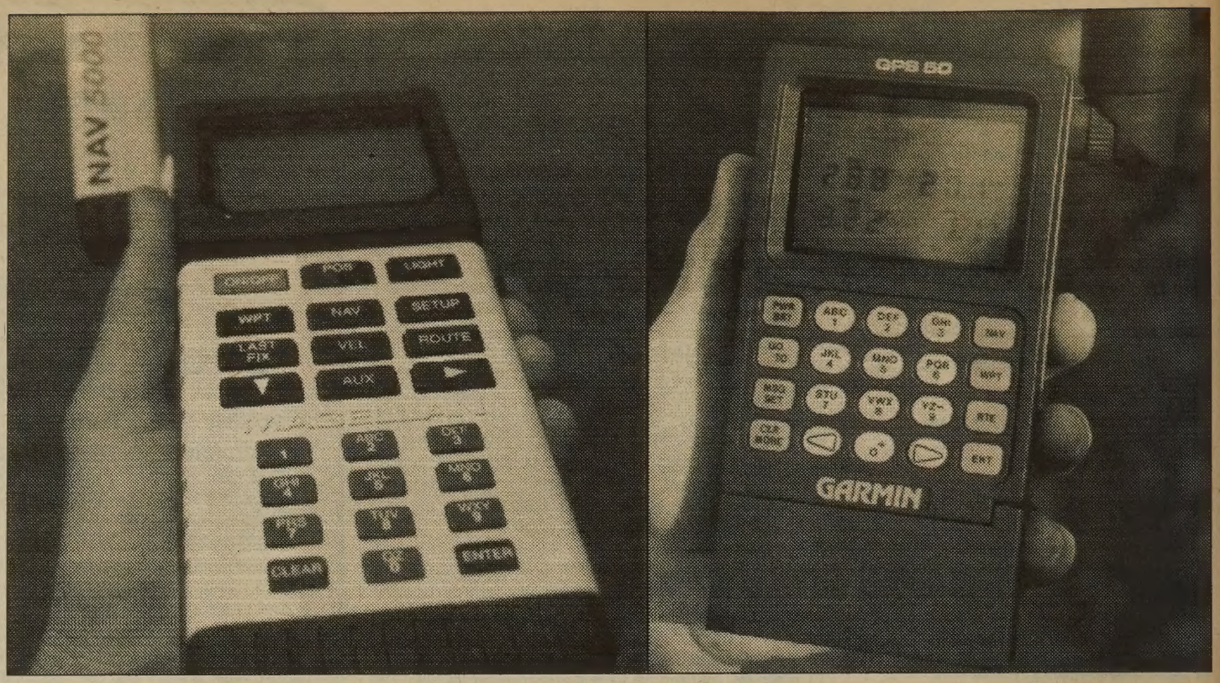

Photo D. Some GPS receivers will fit into the palm of your hand. (Photo by Gordon West WB6NOA).

Both Loran C and GPS receivers include features which alert you when the receiver is unable to receive an accurate signal. A low battery and other malfunctions may also be indicated.

For users who require extremely high accuracy, an advanced GPS system called differential GPS is available.The error which is detected by GPS receivers within a limited geographical area is similar from receiver to receiver. Therefore, if a GPS receiver is installed at a known location, one can find the error which applies to GPS receivers in that area by subtracting the known location from the location which is detected by that GPS receiver. In a differential GPS system, a radio transmitter transmits the error information to other GPS receivers in the vicinity. Differential GPS is used in the offshore oil industry, where it sometimes is necessary to know the position of an oil exploration vessel, within an extremely high degree, over the ocean floor.

Both Loran C and GPS receivers are manufactured in portable and mobile units. The antennas for both Loran C and GPS are small and easy to mount aboard a boat, an aircraft or a vehicle. RF

Organizing a Club Emergency Plan

by Charles M. Seay Sr. KN4HL

The purpose of an emergency plan is to assist in the handling of communications in the event of natural or man-made disasters or emergencies. This assistance may be to individuals or a unit of the federal, state or local government. This club plan should be organized through a club emergency coordinator, in conjunction with a local emergency management team. Good communications and working relationships with your local emergency management team are important. This team should include your local chief of police, fire chief, communications center and the department heads of essential departments of government services.

The rhetoric sounds great so far, but let's get to work. Your club must have a plan coordinated by your club emergency coordinator. An effective plan must designate the following, if it is to function properly:

(1) A net control station. This station would act as your communications clearing house and would operate under the guidelines set forth by the club emergency coordinator.

(2) Assistant net control station(s). This station would carry out auxiliary functions as assigned by net control and/or the emergency coordinator.

(3) A list of provided services. These may include the following:

A. Severe weather spotting and reporting to your local weather service office or to your local emergency management team.

B. Evacuating people to safe areas during floods and hazardous spills or other conditions.

C. Maintaining an inventory of people during emergency shelter operations.

D. Vehicle accident notifications. Amateur radio operators are first on the scene of many auto accidents and can provide valuable help to local police and emergency personnel by making accurate reports as to type, location and injury situations at the scene of the accident.

E. Earthquake damage assessment and reporting to local officials in times of emergencies.

F. Assisting essential services departments such as water, sewer, gas, fire and police departments during times of emergencies.

(4) A written plan of action that describes the purpose of the plan and duties of all members of the club during activation of the plan.

(5) A continuing plan of training so club members will know what information to report to net control for dissemination to the local emergency service center. As an example, in reporting a vehicle accident the emergency services dispatcher would need to know: the number of vehicles involved; the number of persons injured; the exact location of the accident; and other hazards caused by the accident, such as debris.

Training can be provided to club members by members of your local police, fire and emergency service departments. Training by members of these departments will make club members a valued asset to these departments.

I cannot stress enough the importance of good public relations with the department heads of your local governments. Gaining the confidence of the department heads is essential if your club's emergency plan is going to work in a way that benefits both club members and the departments.

The emergency plan of your club must function on a day-to-day basis and not just during simulated tests. This means that club members should monitor a local repeater or a designated simplex frequency at all times. A plan is useless if a club member cannot make contact when an emergency exists.

Club emergency plans operating on a day-to-day basis will insure acceptance by local authorities. When police and fire chiefs know you are out there and can be counted on in an emergency they will respect you and encourage your club to become more involved. Club members will receive great satisfaction from a job well done. Proper training and a good working relationship will insure a smooth operating plan.

Our local club members monitor a local repeater at all times. In order to activate the emergency plan, a member simply transmits a long tone "O" for three seconds. This procedure keeps club members from having to listen to local chatter at a high audio level. With the audio level turned low, members will still hear the long tone "O."

Having a club emergency plan is great, but the excitement comes in putting the plan in action. Public service is one of the hallmarks of the Amateur Radio Service. Activation of your club's emergency plan insures that objective and provides your club with great local publicity. RF

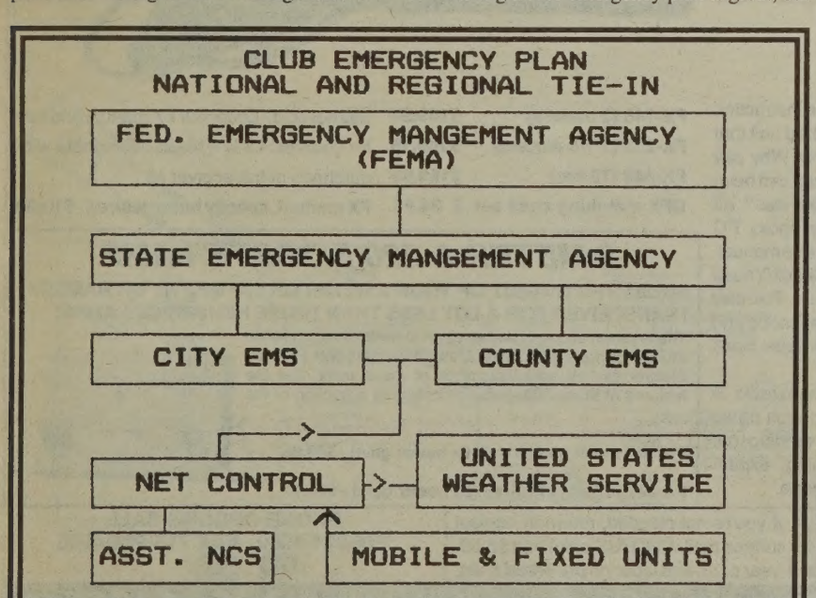

Figure 1. An example of a club emergency plan with regional and national tie-ins. Arrows indicate traffic flow from the club emergency organization.

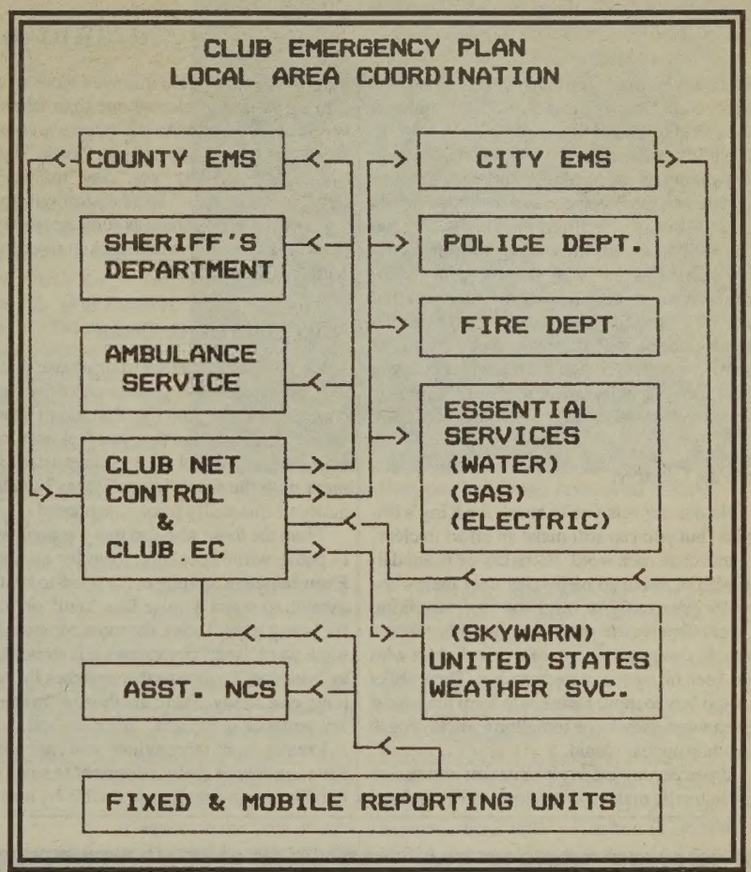

Figure 2. Local club emergency plan organizational chart. Arrows show the information flow pattern.

Your Radio Face

by Michael R. Meltzer K2SDD

Have you ever seen what you look like on television? Do you project an image that you are proud to present to others? Well, how do you think you *look* to the people who listen to you talking on the local repeater? Anytime you engage in a QSO you can expect that there are hundreds of people listening who "see" what you look like with their imaginations. What you sound like and what you say paints a picture in their minds, a mental image of you that they may carry for years. Is your image tall and handsome, or is it sloppy and unattractive? Many people never give it a thought, but if you care about how fellow hams "see" you, it is time to put some make-up on your radio face.

Speak Clearly

No one expects you to speak the King's English, but you can still make an effort to clearly enunciate each word. Hams can be heard daily who mumble so badly that only their closest friends can figure out what they are talking about. The words are all run together into a jumble that reminds one of a prizefighter who has been hit by too many punches. These folks are too lazy to move their lips to form the words. Even when they have something intelligent to say they appear stupid.

If you don't want to give such an impression of yourself, make a conscious effort to form your words clearly. Do this even more so when you speak into a microphone than when you converse in person. Avoid the many common word distortions. Do not say, "yeah," "yuh," "ye'll" or "yup." Say "yes." Say "to," not "ta." Say "no," not "nah." Word distortions are not as "cool" or as in fashion as some people would believe, especially when spoken over the air with hundreds listening.

Make Your Words Count

Do you have a pet word or phrase that you use excessively? Pet phrases can drive people crazy: you know, and like that, don't you see. Okay? One sure sign that you feel uncomfortable is when you feel the need to end each statement with the word "okay." Okay? Do those guilty of this really want a response?

There are those who feel that it sounds wrong to pause while speaking, even for an instant. Even between sentences. It used to be fashionable to insert a noise like "uhh" or "er" to fill in any gaps. Today, the most common filler is the word "and." Sometimes it is stretched out to "aaannnd" as the speaker searches for something else to say. There are those who start *every* sentence with "and." It's quite sad.

I really want to convince you that I really have something really important to say. I really believe that I really can do this by inserting the word "really" into each sentence as many times as possible. Really!

We also have the people who possess a need to insert the word "there" into every sentence, there. You know what I mean, there? You can entertain yourself, there, by keeping score, there. I once heard a fellow say "I'll see you when I get there, there." Repeater listeners were in agony all over the county.

It's neither here nor there. It's six of one and half a dozen of the other. Be that as it may, but some people sure can use an awful lot of words to say nothing. Sometimes it is best to let up on the mike button and let the other fellow make a transmission.

No Profanity, Please

One way to leave the lasting impression that you are a low-class individual is to use profanity on the ham bands. Some people feel that they cannot convince others that what they say is important unless they liberally sprinkle in a few four-letter words. What they do not realize is that for every person who responds favorably, there are large numbers of listeners who visualize the speaker as being tattered, uneducated, and undesirable. Even the mildest of these words should be avoided over ham radio if you hope to convey to listeners that you are intelligent, clean and the kind of person with whom others would want to associate. Don't be crude.

Be Careful with Lingo

Occasionally it is helpful to use the word "over" at the end of your transmission to tell the other fellow or gal that you are about to stop sending and that he may begin. But why do some people feel that "over" is a requirement? Some repeaters have a go-ahead beep, or a nice loud squelch-tail to signal the end of a transmission. Isn't that enough? On single sideband there is no carrier to drop and thereby inform the other person that you have stopped transmitting, so under noisy conditions an "over"' can be useful. But on a strong 2 meter repeater it is *not* necessary to hear, "Back to you. Over. Beep! Kerchunk!" to know that it is your turn to talk. A good whack on the head with a two-by-four would also get your attention, but you really don't need that either.

Ham radio has its own lingo. Citizen band expressions should be avoided. "What's yer personal?" "What's yer 20?" "Comeback." "Come-own, come-own." Hams do not like to hear anything that gives the impression that CB is spilling over into the ham frequencies.

Some speech patterns are not easy to change. Regional accents or poor grammar can take years of study and practice to change, and that may not be necessary. But it takes only a little effort to speak your words clearly, avoid profanity, and resist ending every sentence with, "ya know." Do this and you will project a cleaner, brighter image whenever you converse on your radio. If you follow these simple suggestions I know that next time I hear you on the bands you will be "looking really good." Oh, and one more thing, put a smile in your voice because it makes *me* feel good too. RF

The Rural School and Communication

How new technology in communication and information can help in rural communities.

by Joan Boada Capellades EA3AAB

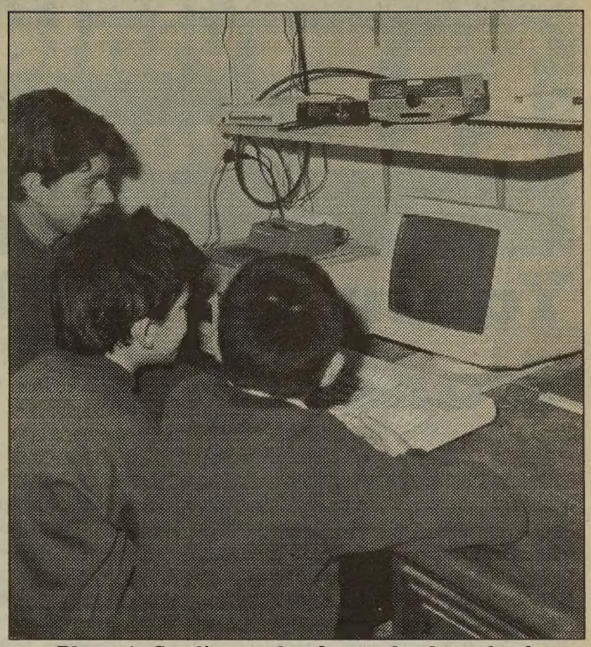

Photo A. Sending packet from school to school.

[Editor's note: The following report, submitted by Joan Boada Capellades EA3AAB, shows how amateur radio is helping schools in rural communities in Spain. The communications reffered to in this article are happening on the 2m and 440 MHz bands. You may reach the author at the address listed at the end of the article.

If anything like this is happening in the U.S., we'd sure like to hear about it.]

Man has always felt the need to communicate and has done so through various ways and means. Languages, written as well as spoken, imagery and symbols are the basis of this communication.

Two methods of communication, among the great many that have been invented, are printing and telecommunications. These have been fundamental in the communication field, greatly influencing our present way of life with regard to their ability to reach a large number of people simultaneously, their great storage capacity, their speed of information processing, and their technological sophistication and appealing presentation.

However, the rural school and its environment are fundamentally lacking in communication and information. This is partly because of the social isolation of these areas. Many families abandon them for more densely populated areas, seeking what is believed to be a better and more comfortable life. If new technologies are to improve our lives, why can't they benefit rural communities? If the students of these rural schools can, with the help of new technologies, make up for the isolation they are currently subjected to, this could result in those living in densely populated areas considering a move to rural regions. The new technologies can create an open, unlimited and non-elitist school, able to merge socially with its surroundings and favoring those with difficulties in accessing education.

For this reason, we are carrying out an experiment in telecommunications* and information exchange between rural schools, with the virtual support being radioelectrical space. The students communicate with each other between schools, exchanging ideas, written work, diagrams and pictures (both static and moving). They receive and process meteorological information (up-to-the-minute maps and data concerning the earth's seasons or satellites). Likewise, teledebates, teleconferences or teleconversations may be held by means of interactive TV, providing a real telepresence between participants. These methods allow us to attain an interdisciplinary and interschool program in a realistic time in a multimedia framework, and more in tune with the reality of the present day world. With this, we are trying to develop a form and means of working, assessing the results obtained with special emphasis on the sociopedagogic context. Without overvaluing the means employed, however, its contribution to the field of education is being evaluated. We hope that the trinomial School-Society-Technology will become a reality, and we will be very pleased if it begins in the rural schools. RF

*With the collaboration of: Emili Ferran EA3EF, Luis A. del Molino EA3OG, Albert Solé EA3PA, Joan Boada EA3AAB, ED3AAB, ED3RDC, Joan Munné EA3ABI, Juliá Freixanet EA3AGR, Marcelino Lleixà EA3BHO, Josep Montserrat EA3BKI, Fernando Merino EA3CTF, Josep Mª Gallart EA3DND, Miquel Pluvinet EA3DUJ, Joaquim Forés EA3GAB, Pere Hill EB3GV, Isabel Munné EB3BDA, Josep Mª Gili EB3CDC, Ramón EB3DLF, Francesc EB3DQW y Esteban EC3CUM entre otros.

Contact Joan Boada Capellades EA3AAB at Ctera. Igualada, 21, 08720 Vilafranca del Penedes (Barcelona), Spain.

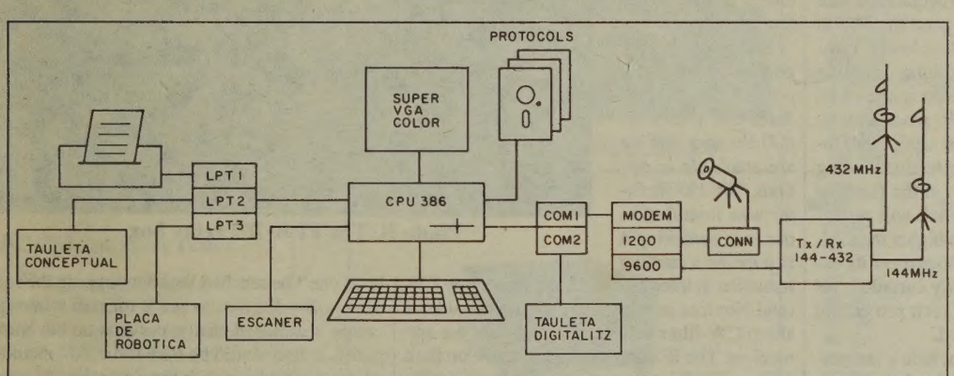

Figure 1. Equipment for a rural school.

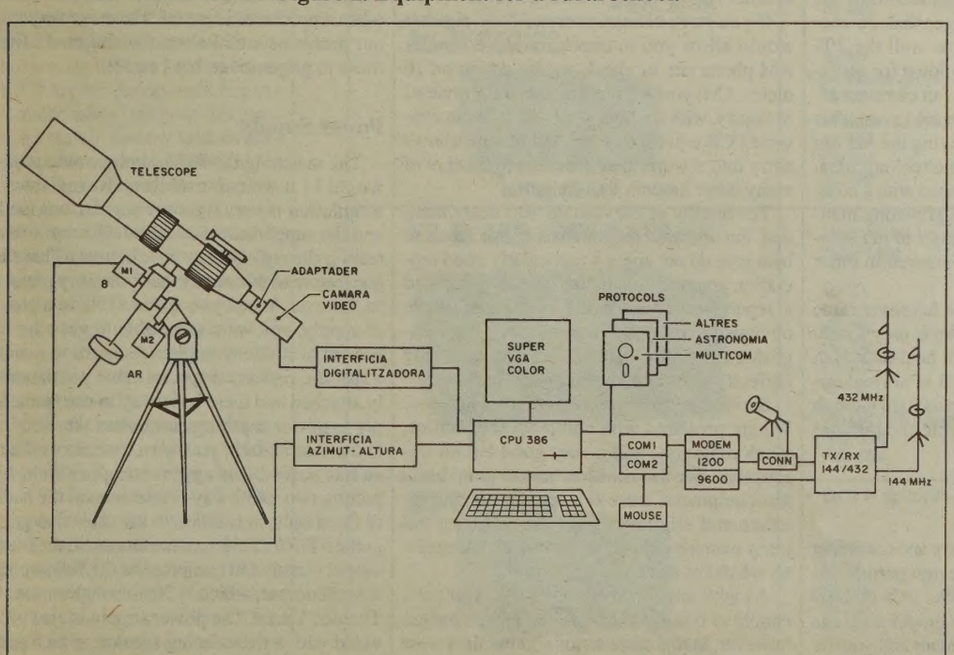

Figure 2. Astrological video transmitting station.

Primary School and Teachers

Coordinator: Joan Boada Capellades

Rural communities:
"Llaromí!" (Anoia), Barcelona (Spain), Ignasi Fernàndez, Emilia Sole i Maria Ayora.
"Font del Cuscó" (Alt Penedès) Barcelona (Spain), María Guilera, Nuria Soler, Dolors Espallargas, Carme Llopart y Matilde Terradas.
Colegio Público "Mediona" (Alt Penedès), Barcelona (Spain), Servand Casas.

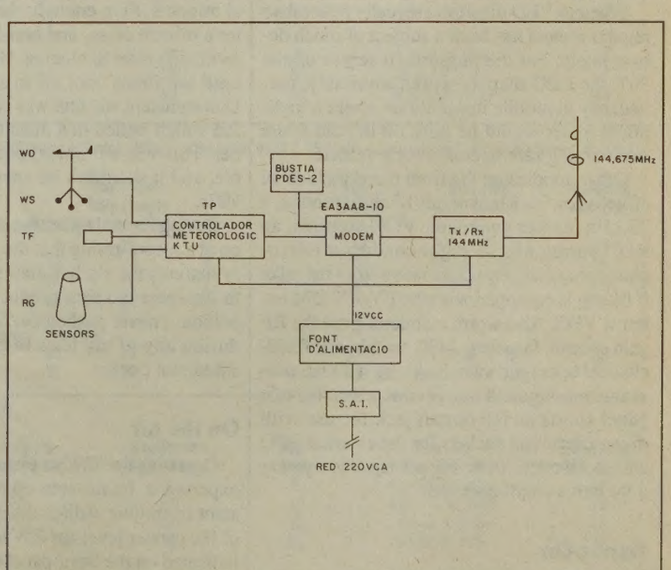

Figure 3. Radio meteorological station.

RF vintage review

Yaesu FT-707 HF Transceiver

by Paul Grupp KA1LR

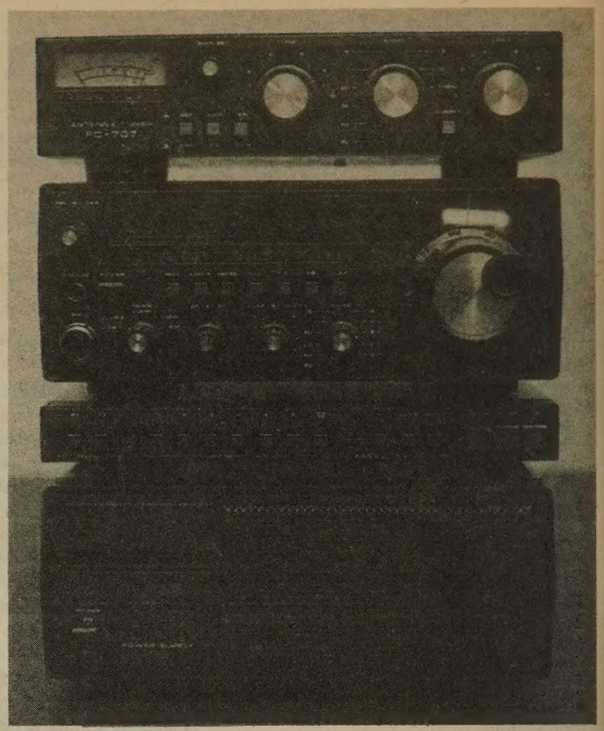

Photo A. The Yaesu 707 line.

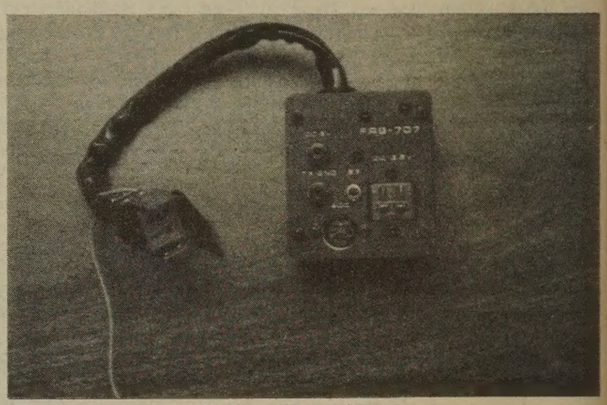

Photo B. The FRB-707 relay box.

Checked any equipment prices lately? When it comes to equipment, hams have never been able to get so much quality and performance for so little money. The Yaesu FT-707 HF transceiver is a good example. It offers features and performance equal or superior to top-dollar rigs of a few years ago. Today, the FT-707 is one of Yaesu's least expensive rigs. It says a lot for the state of the art when a relatively inexpensive transceiver offers the features this new Yaesu does. Let's take a good look at it.

The FT-707 is similar in size to rigs like the Kenwood TS-120S, the ICOM IC-701, and the Atlas 150. It covers all present and planned bands between 80 and 10 meters, including the WARC bands (30, 17 and 12 meters). The bandswitch itself has a very precise feel, clicking smoothly into place, rather than thunking noisily as do bandswitches on many other rigs. Just to the right of the bandswitch is the VFO knob, which also seems to have been engineered for the proper feel.

Yes, the 707 has the digital frequency readout that we now take for granted on high quality gear, but it also offers a well-calibrated and easy-to-read analog display, useful when the companion external VFO and memory unit is in use. Just above the VFO knob are four status LEDs, telling which VFO is in use, if the marker generator is switched on or off, and whether a crystal-controlled frequency has been selected.

The display that attracts the most attention is the front-panel meter, which is a multi-segment bar-type LED display. The lower-value segments glow green, higher readings are yellow, and the highest readings show red. This display does more than impress your friends. It allows you to keep tabs on signal strength, relative power output, and ALC level.

Whether LED displays are really better than regular meters has been a subject of much debate lately. For the purposes it serves on the 707, the LED display works admirably, particularly in mobile installations where a traditional meter would be difficult to read while maintaining safe operation of a vehicle.

Other goodies on the front panel include an effective noise blanker, an IF shift control, a 25 kHz marker generator, VOX controls, an RIT control, and an eight-conductor microphone plug that permits scanning from the mike if the rig is equipped with the FV-707 DM external VFO. Also worth mentioning are the RF gain control, fast/slow AGC switch, and fixed-channel operation switch. Along with the usual antenna, key, and power connectors, the rear panel sports an RF output jack for use with transverters, and sockets for the external VFO and accessories. Yaesu has managed to squeeze a lot into a small package!

Hands-On

As soon as the rig was in place, the manual read, and basic operating parameters checked, I put the rig through the wringer. I connected the 707 to my Drake DL-1000 dummy load and checked the power output in the CW mode. A Bird wattmeter confirmed Yaesu's claim of full output on all bands. My sample put out 100 watts +/-10%, with highest output on 80 and 20 meters, and lowest on 40 and 10 meters. Several other rigs I have tested have dropped by as much as 50% on 10 meters. The Yaesu's performance is admirable.

While I had the 707 on the dummy load, I checked out Yaesu's protection circuits. Like most of its solid-state brethren, the FT-707 finals are protected with a high SWR shutdown device. As the SWR climbs, the rig automatically reduces power to protect itself. Many rigs carry this to a fault, and almost any SWR at all on the line causes a significant reduction in power output.

Yaesu's engineers seem well acquainted with the real world, and they designed the 707 to shut down only slightly at 2:1 or lower. Limiting action is heavy at 3:1 or higher, shutting the output down to a small percentage of its capabilities. This is a sensible arrangement, since many hams operate their equipment into transmission lines with moderate standing wave ratios. Further, a defect in the feedline or an improperly set coax switch will probably cause the SWR to go much higher than 2:1. In short, the FT-707's ability to protect its expensive output devices is hardly curtailed, yet the annoying side effects of such protection have been mercifully banished.

Other protection circuits include a temperature-controlled fan and a thermal shutdown circuit. The instruction manual recommends a key-down period of no longer than 30 seconds, but I wanted to see how well the 707 protects itself, so I left it key-down for several minutes. Sure enough, the fan came on after a minute or so, and continued to run after switching over to receive. Having the fan run until the finals cool off is an excellent idea. Unfortunately, my unit was cursed with a noisy fan which rattled in a most aggravating manner. This was a problem peculiar to my sample, and it shouldn't be encountered in other 707s.

During normal operation the fan never came on at all, confirming that the fan is only a safety feature; the rig has enough heat-sink area to dissipate the heat produced in normal operation. I never pushed the finals hard enough during any of my tests to cycle the thermal shutdown device.

On the Air

Operating the 707 is a pleasant and rewarding experience. Its no-tune-up design permits instant operation. Adjust the mike gain on SSB or the carrier level for CW to proper levels as indicated on the front-panel meter and you are ready to go! Hams who have never operated a solid-state rig are in for an agreeable surprise.

While searching for DX on 20 meters one night, I noticed that tuning in individual signals seemed relatively easy with the 707. Sure enough, when compared to several other popular rigs, the 707 came up with noticeably wider bandspread. The only rig in my possession that performed better in this respect was the ICOM IC-701, whose digital tuning gives it an unfair advantage.

Selectivity is very good, with two eight-pole IF filters standard. CW filters for 600 Hz and 300 Hz are available as options. The 350 Hz filter was installed in our unit; switching it in provides a startling reduction in interference. Hams who enjoy CW (and Novices in particular) should consider a sharp CW filter necessary equipment for any receiver. The IF width control is active on both CW and SSB, with performance comparable to other rigs having a similar control.

If you have always yearned for a rig that would allow you to check into an 80 meter AM phone net, or check out the action on 10 meter AM, you are reading the right review! Seriously, with the high level of interest in converted CB equipment, the AM feature allows entry into a world that is denied to owners of many other modern transceivers.

The quality of the manual also bears mention. For whatever reason, manuals for Japanese ham gear do not enjoy a particularly good reputation among hams in the USA. I'm pleased to report that this is one of the good ones. While obviously written by someone for whom English is a second language, the instructions are perfectly clear and understandable.

Servicing information is pretty good, too. We are provided with complete schematics, block diagrams, and a very good circuit description. For those with access to good basic test equipment, there is a section on maintenance and alignment. We haven't seen too many manuals better than this for any transceiver, whatever its country of origin.

As with any piece of equipment, I found a couple of things I'd like to see Yaesu change; however, in this case, serious complaints were notably absent. The adjustment for sidetone level can't be reached without popping the top cover off—I'd like to see it located where it can be readjusted easily, perhaps on the back panel. It also would be nice if the 707 included some sort of a speech processor. Yes, I know that they are often misused, but there are times when a processor is useful. These are very minor problems, and I almost wish I could find more to gripe about, but I can't!

Power Supply

The matching FP-707 12 volt power supply would be a welcome addition to any shack. Regulation is very tight even under full load, and the supply runs quite cool. (Except when testing the rig's protection circuits!) There is one feature of this supply that I was very pleased to discover. When you spend $150 on a power supply, you want to be able to get a lot of use out of it. Most supplies designed to match a specific rig have a special cable permanently attached and there is no way to use the supply to power anything else unless you tear into the case and add your own connectors. Yaesu has solved this aggravating problem by putting two multi-way connectors on the back of the supply, in addition to the cable that goes to the FT-707. These connectors are in the main output circuit and can provide the full supply current output, which is 20 amps intermittent. Thanks, Yaesu! The power supply is also provided with a front-facing speaker, which performs well for a speaker of its size.

FV-707DM External VFO

The FV-707 is a truly unique accessory, and it changes the whole character of the rig. It resembles a traditional remote VFO in that it allows split-frequency operation, but there the resemblance ends. Measuring only one inch high, the FV-707 is designed to fit underneath the rig rather than beside it, and once installed it seems to become part of the rig itself. The FV-707 can be programmed to store 12 frequencies in its internal memories. Install two AA cells and those frequencies will be held for a year, even when power is turned off! This eliminates the need to buy crystals for often-used frequencies, and it allows an incredible flexibility of operation.

If you are a DX hound, you can scan up and down the band, searching for pile-ups, and program the frequency of a pile-up into each memory, to be recalled later at your whim. If nets are more your cup of tea, the FV-707 will help you keep track of those as well. Indeed, the uses for these memories are limited only by your imagination!

The FV-707 also allows you to scan up and down the band electronically. On the front of the unit are three buttons, marked "Up," "Down," and "Fast." The first two are self-explanatory, and the Fast button works in conjunction with the other two. Normal scan rate is one kHz per second; push the Fast button at the same time as the Up or Down button and the rate increases to 10 kHz per second. With the optional YM-35 microphone, frequency scanning can be accomplished in the same manner using switches mounted on top of the microphone.

FC-707 Antenna Tuner

Designed specifically to complement the FT-707, the matching antenna tuner is a compelling little box. Once you have an FT-707 in your possession, the matching tuner is hard to resist. It sports a lighted meter that keeps track of power output with reasonable accuracy, as well as serving as an SWR meter. An unusual but extremely handy feature of this tuner is the built-in dummy load, switch-selectable from the front panel.

As far as the actual tuning circuit goes, it is important to realize from the start that this tuner doesn't intend to compete with the larger and much more expensive tuners on the market. Maximum power-handling capability is 150 watts, and the tuner will only tune coax lines; there is no provision for random-wire tuning.

Still, the tuner performs its intended job well, which is reducing SWR on coax lines. Just for fun, I tried tuning up a 15 meter dipole on 40 and 10 meters, and the FC-707 handled the job easily. Naturally, such a lash-up didn't work very well, but it did show off the tuner's capabilities! This little tuner should serve well in both mobile and home installations.

Conclusions

Either on its own, or with its accessories, the Yaesu FT-707 is a truly competent piece of equipment. If you are a compulsive knob twirler, you'll find the digital features of the external VFO impossible to resist. If your quest is for solid performance on both SSB and CW, the 707 offers that, too. Its extremely compact dimensions make it an obvious choice for mobile installations, yet the front-panel layout is such that it will be just as comfortable in a home station. If you have any interest in the new generation of compact, solid-state transceivers, this new Yaesu deserves your attention. RF

Reprinted from the March 1981 issue of 73 Magazine for Radio Amateurs.

Four-Element 70 Centimeter Quad

by Larry R. Luchi W7KZE

As the rainy season blew into the Puget Sound, I was giving thought to the second semester of our Electronics Technology Program at Sno-Isle Skills Center. During the second semester I teach amateur radio to my junior and senior high school students, which is a daily block of three hours of classroom lecture and lab. As in the past, each of my students built an AM/FM superheterodyne receiver to give further understanding to my lectures on electronics theory. This gave these teen-age minds a break from Morse code.

December brought rain, rain and, when the sun was about to appear, more rain. January was just a little bit more of December: rain, rain and wind. What does this have to do with young high school minds and amateur radio? A reason to demonstrate antenna theory in the classroom and hope for sun in February. On Groundhog Day, February 2, the sun did peak out to greet my 52nd birthday. With over nine tenths of my life as a ham radio operator, I felt that this was a good time to take the class outside to test antennas that we had constructed in the classroom.

Classroom Lessons

In the classroom, we had constructed a half-wave dipole for 2 meters, 146.580 MHz, using the formula 468 divided by the frequency in MHz to get a length of 38-1/2 inches. Jeff Adams N7ZOE cut the number 10 wire and installed a PIN diode and a Fluke 87 Digital Multimeter in series with the antenna to measure the current. Two meters gave us the compact size and allowed me to show vertical and horizontal polarization.

As I explained the half-wave dipole antenna to my students, a haze came over their eyes ("Like how can this work?"). With our demonstration, some of these bright young minds opened up and started to ask questions ("How can a full wave fit into a half-wave length of wire?"; "If a gallon of milk is a gallon of milk and we drink a glass is it still a gallon ?") My excitement increased with each question. I found my favorite book, *The ARRL Antenna Book*, and started to look for a 1.25 meter quad antenna that could be easily constructed with little cost to the students.

Sno-Isle Skills Center is a vocational high school with 22 programs of instructions, ranging from automotive technology to welding. The resources of the faculty and supplies are a ham's dream come true.

During the last week of January it had rained. It seemed an opportune time for me to build a single-element quad at home to illustrate a full-wave antenna to the students. The third quarter of instruction was communication electronics and the goal of each student was to pass the Technician Plus exams. The half-wave dipole and quad are both antennas that are covered in Elements 2 and 3A of the exams. In my lectures on antennas, the students calculated the length of each type of antenna needed to pass the exams. For quads, the length of the full-wave loop can be calculated from 1,005 divided by the frequency in MHz. If multiple elements are used, the reflector should be five percent longer and the director(s) five percent shorter.

With my *ARRL Antenna Book* in hand, I went to the faculty lounge to discuss my quad antenna project with some staff. I showed Jerry Helm, our construction trades instructor, the drawings of a portable 445 MHz four-element quad. He had a large quantity of #10 house wire, 1/8 inch in diameter, that we could use for the loops. Al Urness N7QDC, our plastics instructor, had the PVC support (spreaders) and a PVC boom. Our machine trades instructor, Mike Fitzpatrick N7REK, suggested he have his students drill all of the holes needed in the PVC (spreaders) supports and boom. It's as exciting to have cooperative working groups in staff as it is to teach in the classroom. It was a good beginning to the second semester.

Element spacing for quad antennas found in literature ranges from 0.14 to 0.25 . Factors such as the number of elements in the array and the parameters to be optimized (front-to-back ratio, forward gain, bandwidth etc.), determine the optimum element spacing within this range. The four-element quad we constructed in class was cut for 445.60 MHz.

Reflector length (in) $= \frac{1046.8}{f_{MHz}} = 28"$

Driven element (in) $= \frac{985.5}{f_{MHz}} = 26"$

Directors (in) $= \frac{937.3}{f_{MHz}} = 24"$

Construction

Construction began with two 10' lengths of 1/2" PVC pipes provided by Al Urness N7QDC. The boom was cut to 14-1/2" long, with allowances given for the two PVC tees: one for the reflector and one for the first director. The reflector PVC tee was glued with PVC cement to one end of the boom, with a distance of 15" to the center of the driven element tee. This was the work of another classroom team led by Jeff Adams N7ZOE and Julia Brill. Jeff made sure that the distance from the center of the reflector tee was 5-3/16" to the center of the driven element tee, and the second director tee was on center 4-7/8" from the driven element. Finally, the first director measured 4-7/8" from the second, then all of the PVC tees were glued into place.

Construction of our first four-element quad began with 1/2" PVC spreaders. These elements were first assembled with the holes drilled for 1/8" number 10 solid copper wire. The reflector spreader was 8" long, with 1/8" holes drilled 3-1/2" from the center of the boom. The driven spreader was 7" long, with holes drilled 3-1/4" from the center of the boom, and the directors were 7" long, with holes drilled 3" from the center of the boom. We used 1/2" PVC for the boom, with PVC tees to install the spreaders. Each spreader was cut in half (i.e. the reflector was cut at 4"), then each end was glued to the tee and then in turn to the boom. The first director was cut at 3", then glued to the tee at the other end of the boom. The driven element and the middle director used two PVC tees cut in

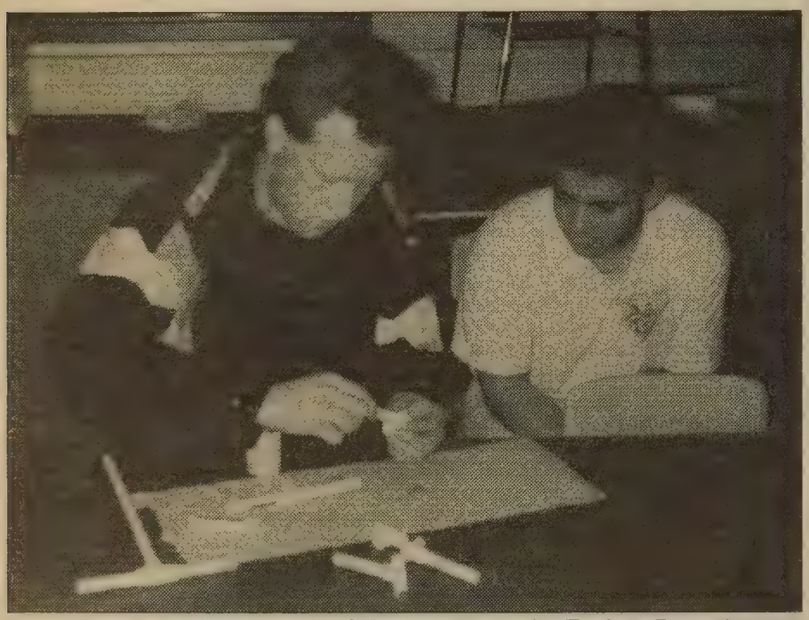

Photo A. Jeff Adams N7ZOE (shown here with Enrique Ramos) begins the assembly.

Photo B. The team. They all just passed their Tech exams.

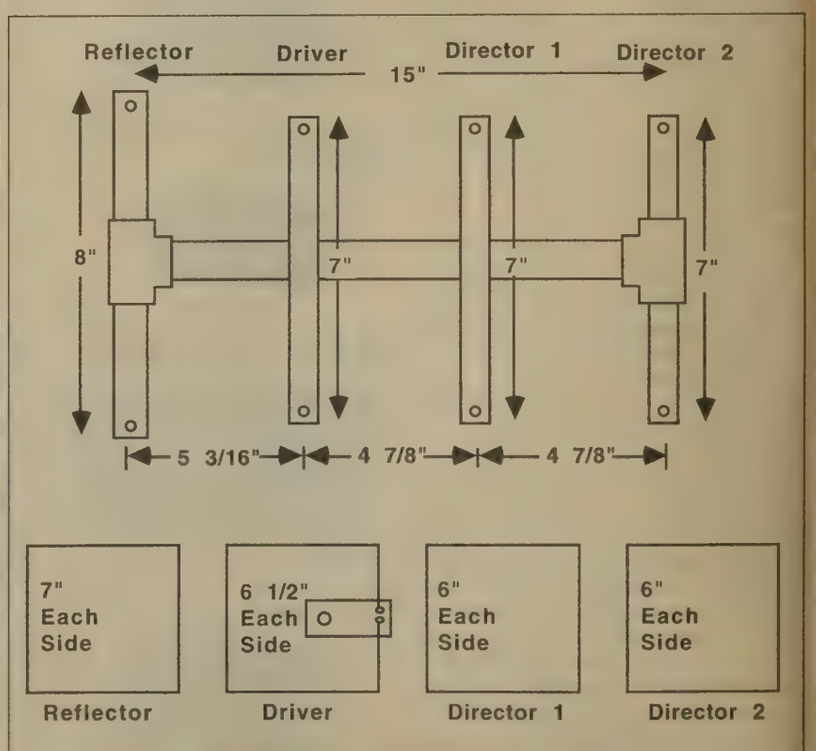

Figure 1. Boom dimensions (top) and element dimensions (bottom) for the four-element 70cm quad.

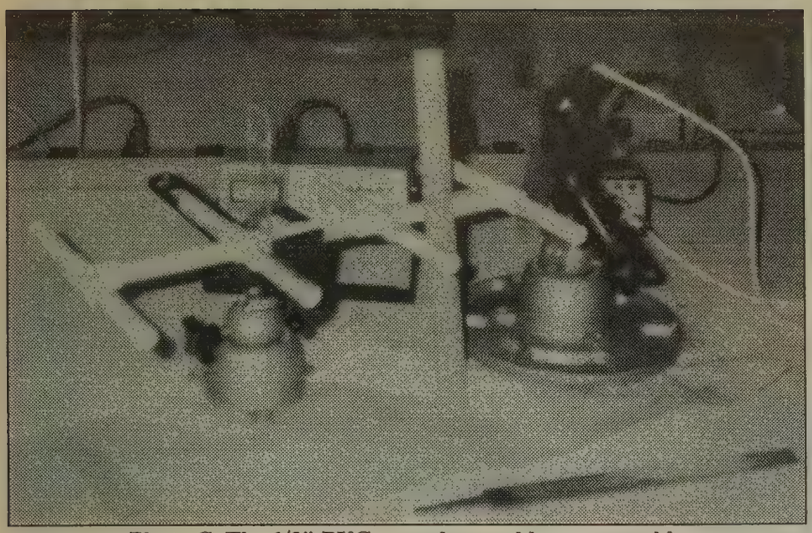

Photo C. The 1/2" PVC spreaders and boom assembly.

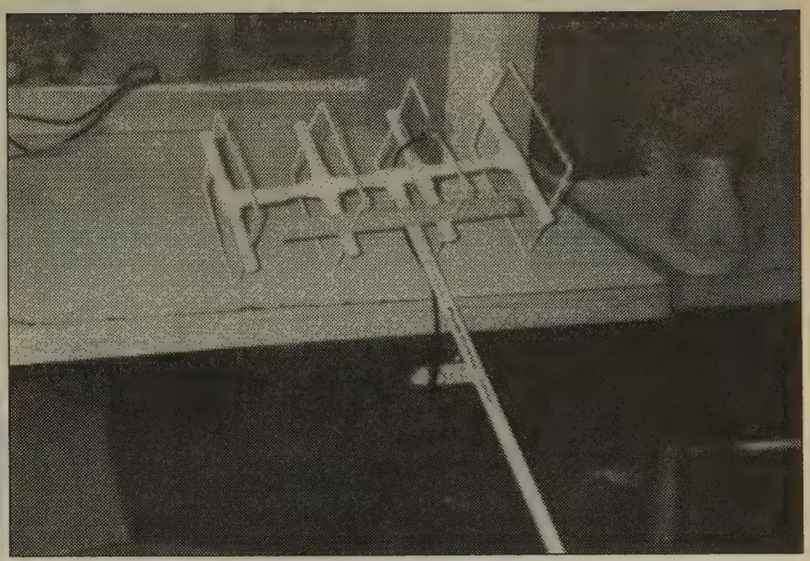

Photo D. The completed quad.

half and glued to their measured place on the boom.

On the reflector, an electrician's copper-wire clamp was used to tune the quad. We pointed the reflector to a hand-held 2 watt transceiver and turned for minimum signal into the input transceiver.

The driven element, with a total length 26 inches, required extra preparation, as the coax feed attachment point needed to be adequately supported. We used a 1" x by 3" Plexiglas plate to support the coax feed line. One end of the Plexiglas plate was cut to fit around the 1/2" PVC boom, where it was epoxied. At the other end of the Plexiglas plate we drilled two holes half an inch apart. The ends of the brazing rods were then bolted to the coax. We made sure to leave enough excess wire so that small loops could be bent in the rod for attachment to the coaxial feedline.

From there, the cable was routed directly to the mast and down. The antenna provided very good performance, with a reasonable SWR over the entire 440 MHz band. We used a Bird wattmeter to measure the reflected power, and found that with 100 watts out, less that 1/2 watt was reflected.

The reason for using house wire for the elements was to keep the cost of our quad to $0, and also to improve the students' soldering skills. For the elements, number 8 aluminum ground wire will work just as well. The cost of the number 10 wire would have been $2.26.

These "Radio Active Students" now know what a full-wave antenna is, compared to a half-wave antenna. The rains stopped as we tested our quads.

Our next classroom project is to build a PVC 10 meter quad. We hope to work you on 10 meters. RF

Parts List

PVC:	10'1/2"
Driven element spreader:	7" of 1/2" PVC
Reflector element spreader:	8" of 1/2" PVC
Two director element spreaders:	7" of 1/2" PVC
Driven element feedpoint strut:	1" x 3" Plexiglas plate
Element wire:	8-1/2' of Number 10 house wire
One can of Nova Weld-P cement	(any PVC cement can be used)
Two feedline terminals:	Solder lugs for no. 10 hardware
Seven 1/2" inch PVC tees	

Menu: Ham and Fish

by Robert C. Green W3RZD

Some years ago, before retirement and high gasoline prices, my wife and I were members of a travel trailer club. We made quite a few trips to the Cape Hatteras area of North Carolina just so the club members could go surf fishing. These guys and gals were so ardent about fishing that, after reaching a campground they would hardly take time to hook their trailers to water, sewer and electricity before taking off for the beach.

On one of our first trips I was talked into going surf fishing. I wasn't particularly keen on fishing. When I said I did not have a rod, one was loaned to me. I was stuck; now I had to go. I remember that day quite well. A few of the gang did reel in some fairly good-sized fish; all I caught was a small sea trout and a very bad case of sunburn.

The "Sand Spike"

In spite of the sunburn, I did enjoy the fishing and when we returned home I bought an 8-1/2-foot surf rod and other gear. One of the items I had been advised to buy was a "Sand Spike." A spike is an aluminum tube about 2 inches in diameter and 10 inches long, welded to the end of a piece of aluminum angle 15 inches long. The other end of the angle is shaped into a point which can be pushed into the sand. The sole purpose in the life of a spike is to hold a fishing rod while its hard-working owner relaxes under a beach umbrella, taking nourishment from cool and refreshing beverages.

On one fishing trip, seeing a bunch of 8-foot surf rods sticking in spikes made me think that it looked like a breeding spot for vertical antennas. Then the thought struck: Why not use a sand spike to support a portable antenna? I couldn't wait to get back to the camp and our trailer so I could try my brainstorm. I had brought a 5 watt 10 meter SSB transceiver and an SWR meter on the trip but hadn't used them yet. Here, at last, was a chance to do some hamming.

Every trailer has a box full of goodies that might come in handy sometime, someplace, and so did mine. The box I had not only contained trailer stuff but some electronic parts as well. These goodies included several lengths of coax complete with plugs, separate SO-239 coax jacks, and hook-up wire. Like any good amateur, I had also put in a soldering iron and a few tools.

I put the transceiver and SWR meter on a picnic table and pushed a spike into the ground. Then I laid the surf rod on the table and strung the hook-up wire from the tip to just above the handle. The 8-1/2-foot rod was just the right length for a quarter-wave 10 meter antenna. Then I soldered the wire at the handle end to the center post of an SO-239 for the coax connection. The rod was made of Fiberglas so I didn't have to worry about insulators or the rod grounding the antenna. The rod handle was put in the spike and a piece of coax was connected between the SO-239 and the SWR meter, and from the SWR to the transceiver. After the 12 volt power supply was connected I was ready to make a contact, or so I thought.

Entertaining an Audience

By this time most of the men of the club had gathered to see what was going on. They thought I was playing with a CB rig, but this was normal as CBs are used when we travel in a caravan. One wanted to know if by using this wire I could contact a CBer maybe a hundred miles away. I took the bull-by-the-horns and told them I was a radio amateur and this was not a CB, but a real honest-to-gosh amateur radio.

Some of them backed off a step or two as if expecting it to explode. Others had a look of awe on their faces; this was their first encounter with a real-life radio amateur. They didn't know what to say or do. Here before them was a figure who had only one head and looked like they did, and since they hadn't seen me biting any little children, maybe I was a human after all. Even to this day I think a few of them still had doubts about amateurs being human.

I turned the rig on, keyed the mike and recoiled in horror; the SWR meter was off-scale. I turned it off and began to ponder this odd turn of events. After replacing the coax and getting the same results, I emitted a few words pertaining to the parentage of the equipment. One of the bystanders finally got up enough nerve to ask what was the trouble. I tried to explain in plain language, thinking maybe I had better be nice and gentle or they still might think I was an ogre speaking in some unknown tongue. They looked at each other as if mental telepathy was passing between them, then after a short pause one of them made a feeble, "Maybe you need a ground."

Of course! How could I have been so stupid? Here I had been trying to show off how much I knew about the complex world of electronics and I got my question answered by a layman. A test clip solved the problem—I used it to connect the coax shield to the spike. Low and behold, the SWR dropped to 1.5:1.

On the Air

The antenna was now loading properly. Ten meters was open and signals from Europe poured out of the speaker. I tuned around the band a bit then called a "CQ." When an English-speaking Italian station came back and gave his location, I noticed a look of amazement on the faces around me. Their CBs couldn't do what I had just done!

The next day we went back to the same stretch of beach. I wanted to try operating from there, but the majority wanted to fish. They knew for sure that the god of lightning would strike me dead on that wet beach and they didn't want anything to do with this crazy nut who had suddenly emerged into their serene lives. The two recruits who had joined the cause the day before, and myself, wanted bigger game. We were after the ones who had gotten away yesterday; we were going to fish for the elusive DX stations.

We set up the sand spike and the fishing rod antenna, and connected the 12 volt motorcycle battery one of the faithful had loaned for the guest. We also had a roll of copper braid that the goodie box had coughed up. Normally, the braid is used to ground the trailer in a campground that doesn't believe in using a grounded power system. Now we were going to use the braid for our ground. We tied a three-ounce lead sinker to one end of the braid and tossed this end into the briny deep, and then connected the other end to the shield of the antenna coax.

We worked Europe, Africa, South America, Canada and a few stations in this country. It was utterly amazing what 5 watts can do, especially when helped by the Atlantic Ocean.

At the campground that evening, while everyone was enjoying a pot-luck dinner, the conversation centered on the fishing for that day. Gradually the talk drifted around to how little ol' me had talked to all those people all over the world. Fish dropped from the menu, and for a while a ham took its place.

Before the evening was over, the two men who had shown so much interest the day before and in the operating that morning, and who by chance lived in the same city I do, asked if I could help them get their amateur licenses. I remember that one of them said, "You know, radio can sure be a hell' a lot of fun." I could not have agreed with him more. RF

RF user's report

The Kenwood TS-50S

by Dan Beugelmans, M.D., KV6X

Kenwood USA
P.O. Box 22745
2201 East Dominguez St.
Long Beach CA 90801-5745
Price Class: $1,200

All of a sudden, there it was, on the back page of my latest ham radio magazine! The TS-50S—a super-compact HF all-mode 100W transceiver, the size of my 2 meter mobile radio. Not only was it tiny, but it had such "hot" features as DDS, AIP, IF Shift, Reverse CW, and a host of menu-programmable options. I just had to have one!

A thousand dollars later it was in my hands. What a beauty! I couldn't wait to plug it into my tribander and 12 volt supply. One push of the "on" button and it said HELLO on its large LCD display. I brought the radio up to 20 meters USB and called FO5JA on my regular sked. Without knowing that I was using a new transceiver, he reported my usual 59. The receiver was quite good—obviously less selective than my TS-940S, but not by far. The IF shift worked quite well, too. After I signed off with FO5JA, a quick call to a UJ8 brought back a report of 58, and I was off and running. Overall, the receiver was quite good. The double-conversion receiver is very sensitive (even on 10 meters).

CW worked quite well. Even without the optional CW filter I found the IF shift, combined with menu-selectable full or semi-break-in, to be very comfortable. Furthermore, the CW offset can be selected, as can reverse CW receive, just like the TS-850S. I was pretty well able to work barefoot everything I heard, but there are rear phono jacks for linear relay and ALC control.

FM on 10 meters was a treat. Easy split-tone selection is available, and the squelch works in a smooth manner. Likewise, AM general coverage receive was very acceptable, with reasonable fidelity and 2 watts of speaker output.

The rig has 100 memories and elaborate menu selections to adjust its parameters to your liking. Everything from peak meter reading to the intensity of the LCD display can be selected by the menus.

Just a couple of omissions: The mike gain control is inside the rig (although the menu can select either a high or low setting) and there is no RF gain control, although the use of the attenuator, plus AIP (they can be used together also), was quite adequate.

Considering the tiny size and weight (only 6.4 lbs.), the ergonomics are quite good. There is slow 5 Hz tuning, which speeds up as you tune faster. The RIT is easy to use, and has a readout on the LCD display. The push-buttons and knobs are small but, considering the small size of the front panel, they are quite acceptable. The noise blanker works well with impulse noise, and the mike has both up and down keys, plus four programmable buttons which can access your most-used menu functions.

Operating at 100 watts on FM or RTTY causes the internal fan to turn on and the rig becomes moderately warm to the touch. In these modes I would reduce the power to 50 watts output. The rig can be menu-programmed for 10, 50 or 100 watts output. It tolerates moderate SWR mismatches without a problem. If you wish to get fancy, Kenwood has a matching external auto-tuner available, which is controlled by the front panel of the rig. There is also a computer interface jack on the bottom of the TS-50S.

Do I like this rig? You bet. For its size and price I believe that Kenwood has done an excellent job, and I heartily recommend it. See you mobile or from Europe with my TS-50S! RF

RF user's report

MFJ Enterprises, Inc.
P.O. Box 494
Mississippi State MS 39762
Telephone 1-800-647-1800
Fax: (601) 323-6551
Price Class: $179.95

The MFJ-9020 QRP CW Transceiver

by Morgan W. Godwin W4WFL

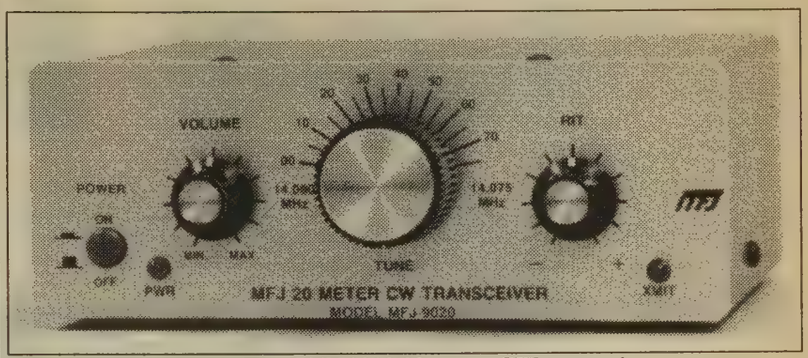

Photo A. The MFJ-9020 20 meter CW transceiver.

When I began making my first amateur radio forays around Europe some 20 years ago, I must have borne a considerable resemblance to a three-ring traveling circus. With a large tube-type transceiver, often an equally large and even heavier separate power supply, and all of the other bits and pieces I then considered necessary I must have made a rather striking figure struggling through airport terminals and railway stations. Even then it was becoming rare to find porters to lend a hand with baggage, so by the time I reached my destination I was invariably exhausted and soaked with perspiration.

Today things are quite different. When I decide that I would like to do a bit of operating during my travels I'm able to tuck everything needed into one of those nice little flight bags one sees everywhere bearing the logos of airlines and tour companies. The nucleus of my present travel set up is an MFJ-9020 20 meter CW transceiver. In fact, that little rig has revolutionized my operating away from home. The other components of my "traveling station" are a 4 amp 12 VDC supply, an MFJ-16010 random wire ATU, a keyer paddle, a small hand key, a pair of lightweight headphones, a roll of hook-up wire for use as an antenna, several antenna insulators, and a short coax cable with PL-259 connectors for use between the ATU and the rig. Bare bones perhaps, but it works well for me.

Operating

I've always enjoyed and preferred low power operation so when the MFJ-9020 was announced, I decided that I wanted one. When it arrived I opened the box and gave it a careful visual check and put it aside as I was unusually busy with other matters. It was several weeks before I got 'round to hooking it up and giving it a try. That evening conditions, while not particularly good, were better than they had been for some time. Connecting it to my multiband vertical through an antenna switch, I was able to rapidly switch back and forth between the little rig and my TS-140S.

Well, everything I was hearing on my TX-140S could be heard on the MFJ-9020 and, to my pleasant surprise, the 9020 handled some types of noise better than the big rig! During a period of approximately an hour, I called six DX stations and received replies from five of them. The average report was 569, not too bad for 5 watts under so-so conditions. Subsequent activity has proven that that first night's activity wasn't a fluke.

Given today's increasingly complex and sophisticated equipment, with dozens of knobs and buttons, it's a pleasure to use the MFJ-9020 with its main tuning knob, volume control and RIT. While the rig's standard eight-pole crystal filter does a fine job, I personally find the optional MFJ-726 narrow audio filter a worthwhile addition (perhaps I've just become too used to listening with a narrow passband). I also find it convenient to use the optional MFJ-412 plug-in electronic keyer. While I would prefer to always use a hand key, the effects of an old injury have progressively robbed me of dexterity in my right hand. As a result, I find a keyer is an increasing asset.

With the rig adjusted for full break-in, it's a pleasure to operate. If for some years my CW activity dropped in favor of phone operation, it was primarily because of the dreadful so-called semi-break-in that most rigs offered. If I can't have full break-in, I prefer to have the receiver muted during transmit. Why so many manufacturers perpetrated their so-called semi-break-in for so long is one of the great imponderables, but I'm delighted to see that virtually all current HF transceivers feature full break-in.

The vernier tuning spreads the signals out nicely, and while it doesn't provide the feel of tuning a Collins 51J4, it's plenty good enough. There are still lots of signals that drift rather noticeably, so the RIT is handy to have. One of the things that makes the MFJ-9020 a pleasure to operate is its Instant Recovery AGC. It really does an effective job and makes break-in operation a pleasure. With just three controls, I can't think of a simpler or more "user friendly" rig.

If anyone has doubts about the effectiveness of 5 watts, I hope that my experience over the years will help to lay their concerns to rest. I've found that 5 watts into even a random wire out a window and into a nearby tree, or down the side of a high-rise hotel or apartment block, is capable of producing amazingly good results. All you need to do is to realize that you are using low power, and to use a minimum of common sense and good judgement. Avoid calling CQ, stay away from pile-ups, look for strong signals to call, and you should have a perfectly respectable percentage of responses and completed contacts. Given reasonable conditions, if you can't work at least a hundred countries with the MFJ-9020 during a couple of contest weekends, then you should look at your operating procedures and make sure that you're getting most of your signal into the antenna.

The only thing I might change if I were purchasing the rig today would be to get the model for 30 meters, as I find it a more interesting and generally more effective band for low power operation. Still, I've found the little rig so interesting and enjoyable to use that I haven't bothered to make mention to the company that the front panel of my unit has a defect with the silk-screening of the markings for the vernier tuning. Perhaps one of these days I'll get around to requesting a replacement.

I would recommend the MFJ-9020 to anyone looking for a first-rate portable or a budget home station rig. Even a newcomer should be able to acquire the skills necessary for effective low power operation within a relatively short period of time. Once those skills are acquired, you'll find that high power operation is not only unnecessary for successful operation, but its use will seem like using a 105mm howitzer for shooting doves.

The MFJ-9020 is made in the U.S.A. and carries the company's one-year "No Matter What" unconditional guarantee.

MFJ has three portable accessories for their CW transceivers: the MFJ-971 portable tuner, which covers 1.8-30 MHz and handles up to 300 watts PEP ($89.95); the MFJ-4114 portable rechargeable power pack ($69.95); and efficient low-SWR portable folded dipole antennas for each of their transceivers ($34.95). MFJ also offers transceivers in four more bands: the MFJ-9040, which covers the 40 meter band; the MFJ-9030, which covers the 30 meter band; the MFJ-9017, which covers the 17 meter band; and the MFJ-9015, which covers the 15 meter band. These CW transceivers are $179.95 each. RF

FAIRS DXpedition

Continued from page 1

There were 30 students present at the first day of five intensive afternoons of code practice and technical training. Of these, seventeen successfully learned the Morse code at 5 words per minute. It was an enthusiastic group, which reflected their desire to learn about amateur radio. One of the students told of listening to hams on his shortwave receiver for 10 years with hopes of one day getting a license. Some of the students had never heard Morse code before but were copying it only five days later. They had been practicing for many hours, but the FAIRS group believes that their success was also due to the fact that they had never been told that code might be difficult, showing that code can be taught easily to open-minded students.

Sixteen new Novices and one new Technician will soon be able to use their U.S. licenses as a means of obtaining their Bangladesh callsigns. This is a temporary procedure being used by the Bangladesh government until their own testing procedure is established.

Mr. Dick Baldwin W1RU, President of the International Amateur Radio Union, was also in Dhaka during the first week of the FAIRS training. His purpose, apart from the FAIRS effort, was to provide a workshop for BTTB government officials and administrations on the international regulations governing amateur radio. The simultaneous presence of both groups appears to have been a success, as high government officials gave assurance that amateur radio would be recognized in Bangladesh.

The FAIRS volunteers say that the trip was a lot of work, but also very enjoyable. They made many new friends, saw an exciting mosque-filled city, and learned much about cultural differences. FAIRS Bangladesh hosted a reception for the international team members, who joined in for the fast-breaking meal taken at sunset during the holy month of Ramadan. A complete station, consisting of a Yaesu FT-757 Cushcraft A3 beam, an IBM-XT computer, and an AEA PK-232, was left in Dhaka to be used as a FAIRS club station and for additional training. Watch for them soon with their new S21 callsign!

For information about FAIRS and how you can help, please contact International FAIRS headquarters at P.O. Box 341, Floyd VA 24091, Fax: (703) 382-2935. RF

School-To-School QSO

Continued from page 1

claiming their accomplishment.

Contact with any amateur station counts, while school-to-school contacts are especially encouraged. Except for satellite QSOs, all contacts must last at least five minutes. Where third party agreements permit, at least three students must communicate to be counted as a valid contact, and the contact must last at least 10 minutes.

For more information on how to become involved in the School-To-School QSO Contest, write to Patrick Lehrman N9JPV, c/o Westmont Amateur Radio Club, 125 S. Grant St., Westmont IL 60559-1907. RF

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advertiser index

RF vintage review

The Drake 2-NT CW Transmitter and 2-C Receiver

by Jim Fisk W1DTY

When the Drake 2-NT transmitter and 2-C receiver arrived the other day, I had to rush right home and hook them up to an antenna. I have a base-loaded multiband vertical on 80 and 40, so I didn't know how well I'd be able to work out. After a quick perusal of the excellent instruction books, and connecting them together for semi-break-in CW, I was all set to go. A quick three-by-three call on the 80 meter Novice band netted three callers up and down the band: a WN1, a WN3 and a WNØ. I called the WNØ and asked the others to QRX. It turned out that the WNØ was out in Colorado and had never even heard a station from New Hampshire. After exchanging reports, we had a nice little rag-chew at about 13 wpm. The 2-NT held up very nicely with 75 watts input—I was running 569 out in WØ land. Next, the WN3—nice report from Philadelphia, 589. The WN1 was almost next door, so the 599 report wasn't too surprising. And so it went, nice reports from Novices all over the country.

Next, I changed the tap on the vertical and tried 40 meters. Lots of QRM, but when I found a clear spot, the 2-NT didn't have any trouble at all working out with very nice reports. The excellent sensitivity of the 2-C picked up the weak ones and the selectivity took care of any adjacent rock crushers. Then, up to 20, 15 and 10. For these bands I plugged in a VFO so I could move around a bit, connected up the tribander, and looked for some DX around 14.010. I heard lots of Europeans coming through; a short call to a PAØ in Rotterdam resulted in a 559X report, followed by several stations calling from DL, SM and OZ lands. After cleaning up the minor pile-up, I moved up to 15—same story in Africa. Some nice reports on the 100 watt signal from ZS6 and 5A3 stations. By this time it was pretty late in the evening so 10 meters was pretty well closed down; I didn't hear any stations on CW, and very few on phone. Perhaps some other time.

After using the 2-NT for several hours, a few of the hidden features that aid in operating ease became apparent. Basically, this transmitter is no different from many other low power CW transmitters; however, these hidden features make all the difference in the world. Essentially, the transmitter is a three-tube affair, with a crystal oscillator, driven amplifier and final power amplifier. The driven amplifier output and power amplifier input circuits are broadband-tuned circuits that are factory adjusted, so no tuning is required by the operator. The pi network in the output of the power amplifier is designed for 50 ohm coaxial lines, and the loading of this network is also factory set. All the operator has to do is turn the rig on, tune the plate-tuning capacitor for a dip in plate current, adjust the *power set* for the desired power input, hook up the antenna and go on the air. And, if you don't want to tune for meter dip, you can tune for maximum brilliance of a built-in neon bulb. Operation is simplicity in itself and it takes longer to read about it than to do it. In addition, no external antenna changeover relays or receiver muting switches, no added TVI filters or "harmonikers"; they're all included inside the 2-NT!

The 2-NT transmitter uses grid-block keying and extremely clean, crisp CW is obtained by a special pulse and delay circuit. Additional

Drake 2-NT Specifications

Frequency coverage	CW portions of the amateur bands from 80 through 10.
Input power	Variable to 100 watts. Plate current meter redlined for 75 watts Novice limitation.
Modes	Break-in CW, semi-break-in CW or manual CW.
Features	Automatic transmit switching, built-in antenna changeover relay, sidetone oscillator, frequency spotting, built-in low-pass filter and simplified tuning.
Antenna output impedance	50 ohms nominal.
Lineup	3 tubes, 1 transistor and 5 diodes.
Accessories available	Antenna matching network, VFO, crystals.
Power requirements	120 volts, 50 to 60 Hz at 2.8 amperes.
Size and weight	9-7/8" x 6-9/32" x 9-9/32", 12-1/2 pounds.

Drake 2-C Specifications

Frequency coverage	3.5-4.0 MHz, 7.0-7.5 MHz, 14.0-14.5 MHz, 21.0-21.5 MHz and 28.5-29 MHz with the crystals provided. Accessory crystals will cover any 500 kHz segment between 3.0 and 30 MHz.
Modes	SSB, CW, AM, RTTY
Selectivity	Selectable passband filter provides: 0.4 kHz at 6 dB down and 2.7 kHz at 60 dB down. 2.4 kHz at 6 dB down and 9.0 kHz at 60 dB down. 4.8 kHz at 6 dB down and 16.8 kHz at 60 dB down.
Stability	Less than 100 Hz after warm up or for 10% line voltage change.
Sensitivity	Less than 0.5 µV for 10 dB signal plus noise to noise on all amateur bands.
Calibration	Main dial calibrated 0 to 500 kHz in 10 kHz divisions; vernier dial calibrated in approximately 1 kHz divisions. Both the main dial and vernier are adjustable for calibration purposes.
AVC	Amplified AVC system has slow or fast discharge and less than 100 microsecond charge. Less than 6 dB audio change for 100 dB RF input change.
Audio	4 ohms output impedance; 1.8 watts with less than 5% distortion.
Antenna input	50 ohms nominal.
Spurious responses	Image rejection greater than 60 dB; IF rejection greater than 60 dB on amateur bands. Internal spurious signals less than the equivalent 1 µV signal on the antenna.
Lineup	5 tubes, 7 transistors and 8 diodes.
Accessories available	2-AC 100 kHz calibrator, 2-LF low frequency converter, 2-CQ speaker/Q-multiplier and notch filter, and 2-NB noise blanker.
Power requirements	120 volts, 50 to 60 Hz, 30 watts.
Size and weight	11-5/16" x 6-9/32" x 9-3/32"; 13-1/2 pounds.

features of this circuit are afforded by the relay which it controls. This relay switches the antenna from transmitter to receiver, mutes the receiver, turns the sidetone off and on in time with your keying, and grounds the cathode of your VFO if you use one.

A built-in transistorized 900 Hz phase shift oscillator generates a sidetone which may be used for monitoring your keying. There is a connector on the rear of the 2-C receiver for the sidetone signal; on other receivers it should be connected to the arm of the audio gain control. With these connections, the receiver works normally during receiving, but when it is muted for transmitting, the sidetone comes through the phones. In addition, when the transmitter is placed in the standby position, the 2-NT may be used as a code practice oscillator, in conjunction with the receiver. In this mode the key only controls the sidetone oscillator; none of the other stages are energized.

Another operating aid is the spot switch. With this switch you can spot the frequency that you are operating on without transmitting a signal. It is always good operating practice to listen before transmitting, and the spot switch on the 2-NT allows you to do just that. Only the low power frequency determining stages are energized during spotting; no power is applied to the final stage.

All in all, the 2-NT transmitter is one of the easiest to operate that I have ever used. All the controls have a purpose, and all the "set and forget" type controls have been adjusted at the factory. In addition, no accessories are necessary to put an outstanding signal on the air. For the Novice, the 2-NT appears to be an ideal *starter* transmitter; even many Generals will find it to their liking.

The Drake engineers really put their heads together when the 2-C receiver was on the drafting board. What they have come up with is a neat combination of vacuum tubes and transistors that does a tremendous job. Vacuum tubes are used throughout the amplifier, mixer and IF stages, but transistors take over in the high frequency oscillator, detector, BFO, AGC and audio stages. A total of five tubes and seven transistors do the bulk of the job, along with eight diodes for detecting and rectifying duties.

The RF lineup is relatively straightforward: a 12BZ6 RF amplifier, a 12AU6 high frequency mixer, two 12BE6 converters, and a 12BA6 50 kHz IF amplifier. The two inputs to the high frequency mixer consist of the output of the RF amplifier and the output of the 2N3394 crystal oscillator. The output of the mixer stage is 3.5 to 4.0 MHz. This 80 meter signal is mixed with a 3955 to 4555 kHz VFO in the first 12BE6 for a 455 kHz IF output. The second 12BE6 converter accepts either a 405 or 505 kHz input to put a 50 kHz upper or lower sideband into the 12BA6 IF amplifier. A 50 kHz bandpass filter in the 12BA6 input provides an adjustable passband selectivity of either 400 Hz, 2.4 kHz or 4.8 kHz at the 6 dB points.

The sensitivity and selectivity of this lineup is really tremendous. The 0.5 µV sensitivity for 10 dB signal plus noise-to-noise on all-band from 80 through 10 really pulls in the weak ones. Like the old adage says, if you can't hear 'em, you can't work 'em. And after a few minutes warm up, the drift is not detectable; even with a 10 volt change in line voltage the drift is only barely perceptible. When a strong local comes on the 2-C performs admirably. The 12BZ6 contributes a great deal to this because of its low intermodulation characteristics, but the variable passband filter does most of the work. When the going really gets rough, you can turn it down to the 0.4 mark; in this position the bandpass is still only 2.7 kHz wide 60 dB down.

The amplified AVC system works extremely well. When the stations are weak, there is almost no AVC voltage applied to the RF and IF stages, but let a strong signal come on and immediately it is at a comfortable listening level. In fact, there is less than 6 dB audio change for a 100 dB change in RF level. To give you an idea what this means, 6 dB is about the difference between programming and commercials on TV; 100 dB is the same as comparing a 1 watt transmitter to a 10-trillion watt transmitter. For different types of operation, the operator may choose slow or fast AVC release times, or he may turn the AVC off.

The 2-NT transmitter and 2-C receiver, working singly or as a pair, provide an extremely convenient and economical starter station for the Novice. And when the Novice advances to the General ticket, many will find that this equipment is still ideally suited to their needs. For SSB and RTTY operation, the 2-C stands up right along with many of its more expensive cousins, so when the General ticket arrives there is no need to go out and buy another receiver. For portable or Field Day operation, the pair is ideal. They are compact, easy to tune, require a minimum of outside accessories and require a minimum amount of power—perfect for low power gasoline generators. RF

Reprinted from the January 1967 issue of 73 Magazine.

the tech side

by Michael Jay Geier KB1UM

More Video

Last time, we were discussing SSTV (Slow-Scan TV). Let's continue with that.

Options

When SSTV began, many years ago, there was no digital technology. If you wanted a TV signal slow enough to send over a 3 kHz HF channel, you had to generate that signal as slow as you needed it right from the start because there was no way to store a normal, fast signal and then read it out at the slower rate. So, the signal was provided by a special SSTV camera, which was much like an ordinary TV camera except that it was scanned very slowly. Naturally, that made live pictures of the operator next to impossible; who could stay perfectly still for eight or more seconds? Of course, people did it anyway, which resulted in blurry, but still fun, pictures. The easiest thing to send was a photograph or stationary object.

The camera problem was tolerable, but the display problem was much worse. How do you store an image long enough so that the top is still visible by the time the scan gets to the bottom? Again, because there was no digital storage, it was quite a problem. The solution came from radar technology. Radar display tubes used a type of phosphor (the rare earth material coating on the inside of the display's face, which glows when struck by the electron beam) which persisted for a long time, because radars, with their slowly revolving scanning antennas, were stuck with the same problem! So, special SSTV display tubes were developed. They were much like small TV picture tubes, except that they had the long-persistence phosphors.

It worked, but it was awkward to use. You needed plenty of light for the camera, but then you needed to dim or kill the lights in order to view the display. But, hams being who we are, we lived with the problems and had fun with the technology anyway. The thrill of seeing another operator's face from thousands of miles away more than made up for the hassle the equipment provided.

The most popular provider of this kind of SSTV gear was a company called Robot Research. Now and then you can still see an old persistence-type SSTV setup for next to nothing at a hamfest but, believe me, you don't want to buy one of these things. When digital technology came along in the early 1970s, Robot, along with other companies, quickly capitalized on it by developing scan converters, which are boxes that store normal TV signals, convert them to slow-scan signals, and take incoming SSTV tones and convert them back to still pictures you can display on any normal TV.

The first digital scan converter to become popular, the Robot 400 used the same eight-second, 128-line format employed by the old persistence systems. That way, the new gear could communicate with all those old units already out there. The picture quality was better than with the old stuff, but it still wasn't great. Each line had 128 pixels (picture dots). Multiplied by the 128 lines, that made for 16,384 total pixels, which may sound like a lot but really isn't. In comparison, a normal TV picture has about 130,000 pixels! The 16,384 pixels were technologically convenient because they fit exactly into 16K of RAM, and memory chips were extremely expensive in those days; early computers often came with only 4K. The RAM was 4 bits deep, which meant that you could have 16 levels of gray. That's not much, but it is quite viewable.

You can still find Robot 400s at hamfests, typically in the $50 to $100 range. Although signal standards have evolved to where very few U.S. operators are still using the old eight-second format, most new units can still do it, and most SSTVers will be glad to switch to it for you if you ask them to. Also, the format is still quite popular in Europe, so there are plenty of people with whom to communicate. Finally, there's an easy modification which will permit 400s to view (but not send) the more popular 36-second pictures. On a 400, they don't look any better than eight-second pictures, but at least you can see what is going on. I still have my old unit, and I still have fun with it.

Hey, Slow Down!

You might think that, in keeping with other technological trends, signals would be getting faster, resulting in shorter transmission times. Just the opposite is true. The demand has been for higher quality pictures, and that means more information must be sent. Also, who wants to look at black and white anymore? As with broadcast TV, color has become almost mandatory. So, because of the 3 kHz bandwidth limitation, pictures containing all this extra information take longer to send.

Perhaps in the future, as sophisticated data compression and digital modem schemes arrive, we will be able to squeeze more info into each kHz, and image transmission will speed up. For now, though, we still convert the brightness of each pixel into a varying audio pitch, which results in an analog FM transmission method. I know that sounds confusing but, even over an SSB radio, the audio tones themselves represent FM; the frequency of the tone is modulated by the brightness values in the SSTV signal. That helps avoid noise and signal degradation, but it is not very efficient.

Until recently, Robot Research has continued to lead the way in SSTV. Their 36-second color format has been extremely popular, and the 72-second format provides a near-broadcast-quality image. The Robot 1200 provides those formats, along with the old eight-second B/W and 12-second color systems. Now, however, there's a whole new method of doing SSTV, and it is catching on in a big way.

Enter the Computer

Many hams have computers. Today's computers are very good at displaying and manipulating images. So, it seems natural to put them to use doing SSTV. There are systems for various machines, including Macs and PCs, which can send and receive SSTV. Some are very simple receive-only programs and interfaces, and those are great for getting your feet wet and seeing if you want to plunge in all the way later on. Some let you send as well, but they are limited regarding which modes they can do, and the quality isn't the greatest. Finally, there are full-blown computer SSTV systems which can do everything dedicated boxes do and more.

One computer has gotten especially popular for SSTV because of its inherently slick video capabilities and its excellent price/performance ratio: the Commodore Amiga. There's an SSTV system made for it called AVT (Amiga Video Terminal) and it lets you do all the Robot modes, some newer ones called Scotti, and a few which are specific to the AVT system. (In fairness to Robot, there's an upgrade chip for the 1200 that adds Scotti and other modes, so the dedicated box approach is far from obsolete.) Computer SSTV requires circuitry to digitize the incoming video signal from your camcorder, as well as specialized software to process and scan-convert the image into the SSTV format of your choice. Naturally, all that capability is going to cost some money. But, if you're really serious about SSTV, it is worth it. One of the nice things you can do with computer SSTV is image enhancement. Thanks to static, fading and especially QRM (interference from other stations), just about all SSTV pictures you receive will have some "hits," or damaged spots, in them. With a normal, dedicated SSTV box, you are stuck with them. With a computer, though, you can use software to interpolate from surrounding pixels and fill in the hits with reasonable guesses regarding what probably should have been there. The result is a cleaned-up picture that may show little, if any, damage from having gone around the world.

Save Me

OK, you've received really nice SSTV picture of a new friend from Italy or Australia. Now what do you do with it? Obviously, you'd like to save it so you can look at it another time. But how? With the older equipment, you can save the picture out as audio tones to a cassette recorder. That works, but it is hard to find the particular picture you want. Also, there's some degradation because the picture is being converted to audio and back. With a computer system, though, you can save the picture on a floppy or hard disk, with no degradation whatsoever.

Got the Picture?

I hope I've intrigued you enough that you'll go check image transmission out. Whether ATV or SSTV, it's a blast! There's just something much more personal about seeing pictures than there is about faceless voices coming from a speaker. If you ask around, you probably can find a local ham who has image equipment. I'm sure he or she would be thrilled to give you a demonstration. That's how I got hooked. Have fun, and I'll look forward to *seeing* you on the air!

Now, let's look at a letter:

Dear Tech Side,

I've gotten interested in RTTY and purchased a receive-only interface for my computer. I can read hams OK, but when I try to tune around the rest of the shortwave bands many RTTY stations print only garbage on my screen, no matter what I do. Am I doing something wrong, or are they trying to keep their messages secret somehow?

Signed, Whatta Mess

Dear Whatta,

Could be both! Hams usually use Baudot code and 170 Hz shift between the mark and space tones. Commercial stations use all kinds of other things. First, they often use wider shifts, such as 850 Hz, and they also may transmit "upside down." That is, the mark and space tones may be reversed. If your software allows it, try inverting the reception. If not, switch your radio from LSB (the usual ham setting) to USB and retune the station. If that still won't work, the station may be using another code, such as ASCII, or you may indeed be receiving encrypted material. Many commercial and government senders utilize techniques, such as time-division multiplexing, to prevent unauthorized eavesdroppers like us from reading their mail. Oh well, I guess you can't have everything. Good luck!

'Til next time, 73 from KB1UM. RF

radio magic

by Michael Bryce WB8VGE

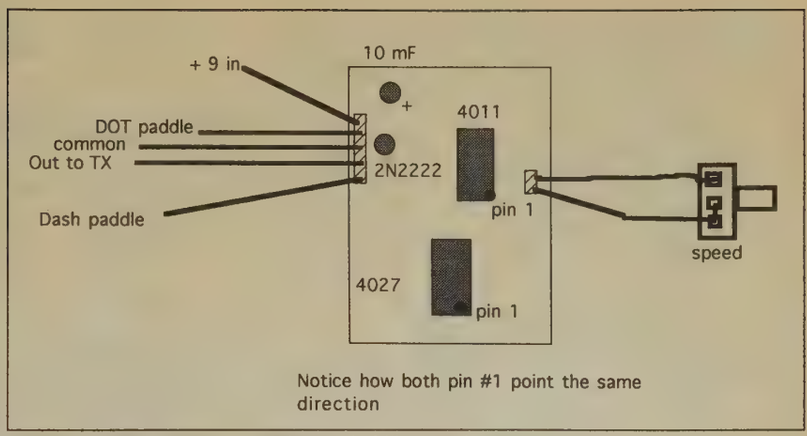


Figure 1. Wiring diagram.

With a little bit of luck, you'll have all the IC sockets and resistors in our keyer project (May 1993 column) in place by now. Those of you who are more experienced builders may even have all the remaining parts installed and ready to try out.

This time, while you're waiting for the soldering iron to heat up, we'll install the capacitors.

The keyer has just a few capacitors to install, and most of these are ceramic or mylar. You can install these without worrying about polarity. As in the case of the resistors, it's good practice to install the capacitors so their markings are easy to read. Of course, you can't do that when you're installing electrolytic capacitors as they're polarity sensitive and must be installed correctly or they won't work.

Sometimes when you install a ceramic capacitor, the coating from the main body of the capacitor also coats the wire leads. You can't solder the lead to the PC board while this coating is present. You must remove it before you install the part and try to solder it in. To remove the coating, simply grasp the wire lead with the nose of a needle-nose pliers and twist the coating off. The coating is very hard, and will flake right off. Be sure to get it all as only a small spot will cause you trouble when soldering to the PC board.

Solder in the capacitors and clip off the leads. Next, install the 10 mF electrolytic capacitor. Watch the polarity when installing this capacitor. How do you know what lead is what on the capacitor? Well, usually one lead is marked with a black strip on one side of the capacitor's body. This black strip is USUALLY negative. Never assume and always check! Sometimes the positive lead is marked with a "+" sign inside a circle on the side of the capacitor's body. I've also seen the same thing done with the negative lead with a "-" inside a circle. Each company has a different way of marking their product. There doesn't seem to be any standard being followed.

About the only parts left to be installed are the diodes and the switching transistor. We'll start with the diodes as they're easy.

Notice that on the PC board parts overlay (May 1993 column) the positions marked with diodes have one end banded with a black strip. Hold up a diode and look at the ends. You'll see one end has a colored band. So, when you install the diode on the PC board, you install the diode so the band on the diode agrees with the band on the PC board. A diode installed backwards will not function correctly. It only takes one misinstalled diode to prevent a circuit from operating.

Install all four 1N914 diodes in the locations marked on the PC board overlay. Watch those bands and be sure you have them installed correctly.

When soldering in small signal diodes such as the 1N914s, don't let the soldering iron rest on the connection any longer than needed or you'll end up with extra crispy diodes!

That task completed, the remaining part to be soldered in is the 2N4401 transistor. Notice there are three leads on the transistor. These are the base, emitter and collector. They must be installed in their proper holes or the device will not work. In fact, in some cases, installing a transistor incorrectly will result in its destruction. In the keyer, the transistor is shown as an outline on the PC overlay. Shape the transistor's leads into a triangle to match the PC board's holes. Install the leads in the holes while gently pushing down on the transistor's body. Push the transistor down to about a quarter of an inch from the PC board. Don't mount it flush on the PC board. Check the placement of the leads again and if you're happy with what you see, solder the three leads to the PC board.

The final step will be to insert the IC chips in their sockets. Notice that each chip will have either a dot or other marking to signify pin #1. You must insert the chip with the dot shown on the parts placement guide. Be careful when handling the chips—they are subject to damage from static discharges. Each chip will be marked with a number telling you what chip it is. You may see a number such as CD4027AB. Rest assure, it's a 4027. Insert each chip in its correct socket, making sure you have pin 1 going in the correct direction.

You should have all the parts mounted on the PC board now. All that you have to do now is install the wires to the speed pot and connect up the paddle and key line output jacks and battery wires. But, before we get that far along, re-check your soldering and parts placement. This way, if you do find something out of order you're not likely to cook it by applying power before you find the fault.

Wiring Connections

I like to use colored ribbon cable to hook up the outside world to the PC boards I work on. You can use single lengths of wire if you wish, but I've found that using ribbon cable is easier and looks much nicer later on when you're showing off your project to the local club members. Radio Shack sells a spool for a couple of bucks, and I also see the stuff at swapfests all the time. If you use ribbon cable, wack off about eight inches or so and pre-tin one end. This will be the end that we'll attach to the PC board and pre-tinning makes soldering easier. To pre-tin a wire, simply apply a small amount of solder to the wire to leave a coat of solder behind. Don't put a large glob of solder on the wire because you won't be able to get the wire in the holes on the PC board. Install a wire to the DOT paddle, DASH paddle, and OUT TO TX pads on the PC board. With a second length of wire, connect the two PC pads to SPEED POT. You should now have two sets of wires coming from the PC board.

Now you'll need to install a 9 volt battery holder clip. You can get these from Radio Shack or from a dead transistor radio from the junk box. The use of a standard 9 volt battery will supply power for the keyer for about a year, without the need for an on/off switch. On the -9 volt pad, connect a second wire. This will become our ground for the keyer.

Connect the DOT and DASH wires to a three-circuit 1/4" stereo jack. It's really hit or miss as to selecting which wire for which function when wiring up this jack. So, don't solder the wire to the jack just yet.

I like to use RCA phono jacks for my transmitters' key line output. They're easy to install, requiring but one hole and one wire. Solder the wire from the PC board to the center pin of the RCA jack, then solder the two wires to the 470k speed control. Look at Figure 1 to see how this is done. In this case, a picture really is worth a thousand words!

You can mount the PC board in any suitable case. However, if you use a plastic case, you MUST also run the ground wire to the key jack and the paddle jack. There are mounting holes in the PC board, but they're really small, requiring 4-40 screws. A simpler method is to just mount the PC board down with a strip of double-sided foam tape (available from Radio Shack for a dollar or so). The stuff will hold the PC board down and it will really take some pulling to get the board off of the tape.

Continued on page 27

antennas, etc.

by Joseph J. Carr K4IPV

Testing Antennas Without Excitation from the Rig (or, How To Avoid Being a Loudenboomerlid)

One of my pet peeves is the dud dude ("lid" in ham jargon) who works on an antenna while it is excited with full transmitter power. I've even heard some guys who were obviously testing an antenna because of what they said, and were loud enough to be using a high power linear amplifier. Not only is this tactic awfully rude, but it's illegal as well. It can also be dumb. For example, when using certain kinds of traps or antenna tuners, a seriously misadjusted antenna can detune the final and create damage to the rig.

There are, however, several different things that can be done to adjust antennas without excitation from a transmitter. We've already discussed the noise bridge in this space, so I won't repeat that subject except to say its a tremendous way to do the job. Readers are referred to that noise bridge article for further information.

The instruments that are of most use, other than the noise bridge which would ordinarily be in this article, are the following: dipper meter, antenna impedance bridge, and SWR analyzer. The latter is a new type of instrument now on the market from MFJ Enterprises [Box 494, Mississippi State, MS 39762; phone 1-800-647-1800 (voice/orders), 601-323-5869 (voice) and 601-323-6551 (fax)].

Dip Meters ("Dippers")

The traditional "grid dip meter" from vacuum tube days still finds use, and is also available in modern solid-state models (although typically not called grid dim meters). The basic fact that makes them work is simple: When an excited RF tank circuit (the dipper) is coupled to another RF tank circuit (the antenna) on the same frequency, some energy is transferred from the excited tank to the nonexcited tank. This transfer of energy can be seen in the form of a "dip" in the signal level in the excited tank.

Photo A shows the author's Heathkit dipper. Although Heath is out of this business, these meters occasionally show up at hamfest flea markets. Also, MFJ sells their Model MFJ-203 bandswitched dip meter. It is battery powered, solid-state, and comes with a storage case. A set of different coils for a wide frequency range is also provided. The coil is plugged into the end of the instrument opposite the meter movement, and is coupled to the circuit under test.

Figure 1 shows the basic methods for coupling the dipper sense coil to the resonant circuit under test. Figure 1A shows the direct method, in this case coupling to a vertical antenna (I've also coupled it this way to resonant tank circuits . . . that were turned off! . . . in RF power amplifiers, transmitters and receivers). The coil is brought close to the circuit/device under test, and the tuning knob adjusted. When the dip is noted, the resonant frequency can be read off the dial . . . more or less.

When the circuit is inaccessible, like when the antenna is up in the air, you can use the method of Figure 1B. In this case, a 2- or 3-turn loop of wire (a "gimmick") is connected to the coaxial cable as shown. The loop diameter is sufficient for the dipper sense coil to pass into it, but not with a lot of space to spare. Adjust the tuning control to find the dip.

Why did I say "more or less" when mentioning reading the frequency from the dial? The reason is that dipper dials are not well known for accuracy. I prefer to monitor the dipper frequency on a nearby receiver. You will be able to hear the oscillator on a ham or general coverage shortwave receiver, especially if a wire "antenna" is brought from the receiver antenna input to a position close to the dipper (but not close enough to closely couple to the coil).

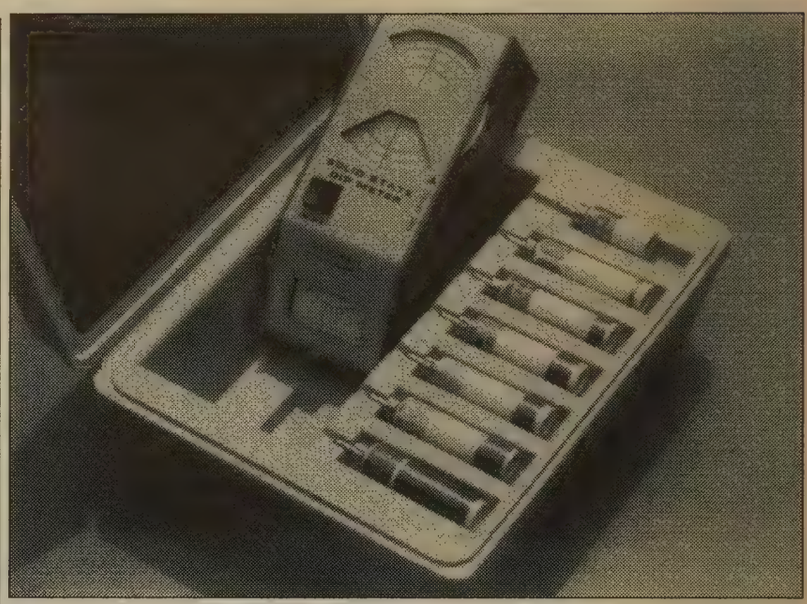


Photo A. Dipper meter and its coils.

The dip on a dipper is very narrow, and tuning too fast is a good way to miss it altogether . . . especially since the meter needle moves a little with the tuning knob anyway. Look for an abrupt and very narrow dip. Most "it doesn't work" complaints are due to too-fast tuning!

Some older grid dip meters show up at hamfest flea markets from time to time. Be careful of those devices. They use a high voltage DC power supply inside to operate the oscillator, and it must be plugged into the AC wall socket. Since antenna work is often done out of doors, or on cement basement floors that are a bit conductive, they are a danger. I recommend changing the two-wire AC power cord to a three-wire version . . . and grounding the green third wire to the grid dip meter housing. Also, when using the device where it's likely you'll become grounded, be sure to use it with a 1:1 isolation transformer.

Antenna Impedance (Z) Bridges

Antenna impedance bridges, a.k.a. "Z-bridges," are used to measure the impedance of the antenna at its feed point. They actually measure the resistive component of impedance, unless they have a separate reactance or X control, but that's all you need. Photo B shows an old Leader antenna impedance bridge that I've used for years. The dial is calibrated in ohms, and it works over the range of less than 10 ohms to 1,000 ohms . . . with the scale a bit expanded in the

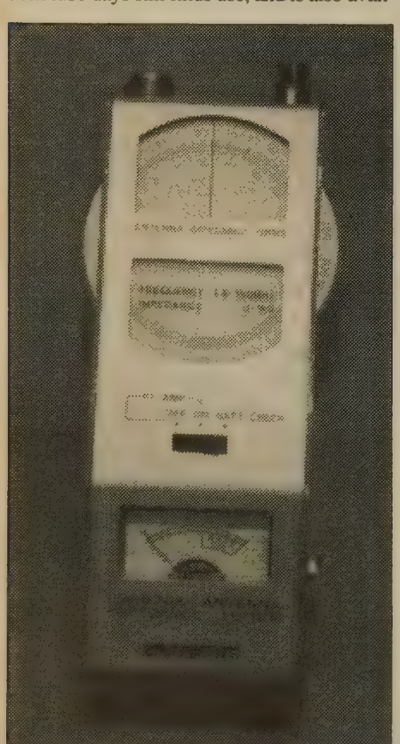


Photo B. Leader antenna impedance bridge.

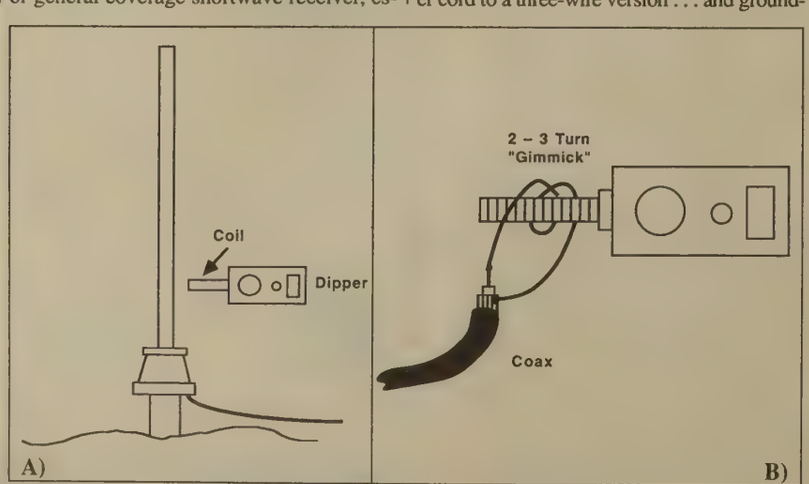


Figure 1. Coupling a dipper to the circuit: A) direct; B) through a "gimmick."

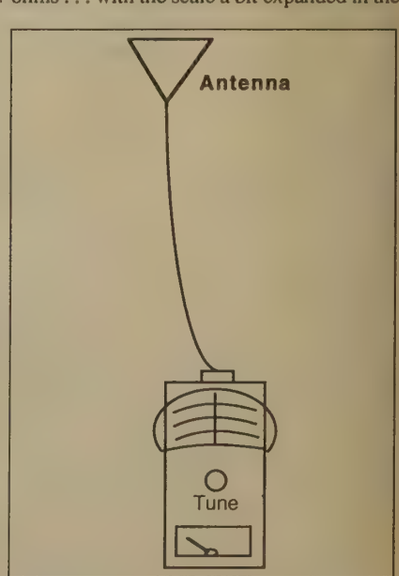
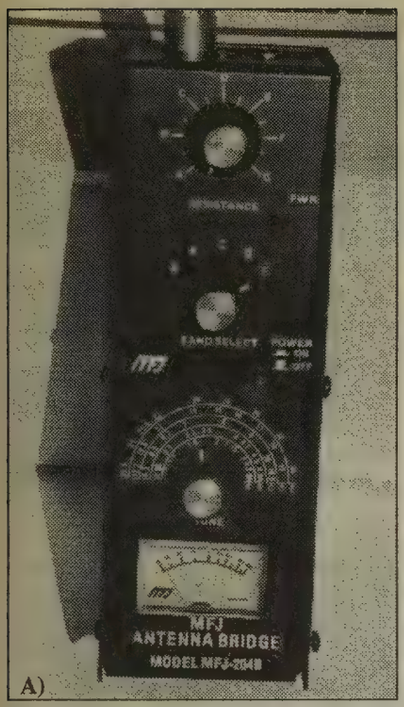


Figure 2. Coupling the Z-bridge to an antenna.



A)

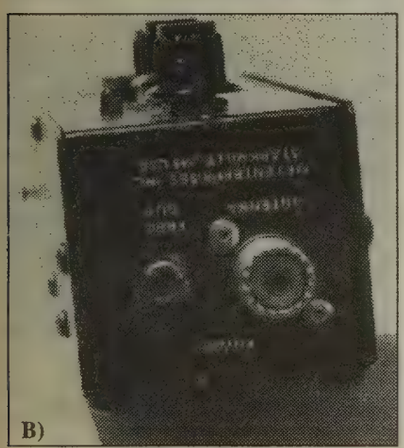

B)

Photo C. MFJ-204B impedance bridge: A) front view; B) end view.

10-100 ohm range of most ham antennas. An external signal source, either a transmitter or a signal generator, is used to excite the bridge. The device has an internal amplifier, so signal generator excitation is sufficient.

Another (contemporary) antenna impedance bridge is the MFJ (address above) Model MFJ-204B shown in Photo C-A (MFJ currently also makes the updated MFJ-205). This instrument contains its own low-powered signal generator, and it will tune throughout the HF spectrum . . . including all ham bands. It also serves as a signal generator for other purposes because it has a FREQ OUT output on the end (Photo C-B). I've used this output both as a signal generator and to monitor the actual excitation frequency (the dial calibration leaves a bit to be desired).

Figure 2 shows how the antenna impedance bridge is used with an antenna. The Z-bridge antenna connector is fitted to the coaxial cable from the antenna. Ideally, the cable should be an electrical half wavelength long, but that is not totally required. The frequency is set to the desired operating frequency, and then the resistance (or impedance) knob is adjusted to show a deep dip on the meter (a shallow dip is sometimes seen, and often means that the impedance is reactive as well as resistive).

SWR Analyzers

The MFJ people now sell a series of several SWR analyzers that are, in my humble opinion, worth their weight in gold. These instruments contain an internal signal generator, a frequency dial, and an indicating meter that is calibrated in VSWR units. The antenna is connected to the coax in a manner similar to Figure 2, and the frequency is adjusted to the minimum VSWR. This procedure tells you the resonant frequency of the antenna (it occurs at minimum VSWR), and the amount of VSWR.

There are about five models of MFJ VSWR analyzer. The MFJ-207 is an HF instrument, while its MFJ-208 companion is for 2 meters (see Photo D). The MFJ-209 is an MW/HF/VHF model that tunes from 1.8 to 170 MHz. Two models, MFJ-247 and MFJ-249, offer (in addition to the VSWR analyzer) an accurate internal digital frequency counter, eliminating the large errors of analog dials as well as the need to monitor on a receiver. The counter can be used to measure other frequencies, or as the dial for the analyzer. It's also possible to use these analyzers as signal generators. I've used the MFJ-207, MFJ-208 and MFJ-247 devices and can recommend all of them . . . especially the '247.

One use for the MFJ-247 that may not be immediately apparent is on the workbench. I recently made a number of 4:1 and 9:1 RF broadband transformers. In order to test the transformers, I connected a resistor to the secondary and measured its VSWR. The MFJ-247 assumes about 68 ohms (trade-off between 50 and 75 ohm systems), so a 270 ohm resistor across the 4:1 transformer, or 600 ohms across the 9:1 transformer, will reflect a minimum VSWR across the band of interest. Checking with other resistors showed higher VSWR readings, confirming the test.

By the way . . .

If you want to help fellow ham and techie Harry Helms, then rush out and buy his book *All About Ham Radio*. Or, alternatively, buy my own book, *Receiving Antenna Handbook*. Harry owns HighText Publications, along with partner Carol Lewis, and he needs the sales (so do I). Contact Independent Publishers Group at 1-800-888-4741 for phone orders. RF

Photo D. MFJ-208 SWR analyzer.

upgrade don't stop now

by Gordon West WB6NOA

Just Tune It Yourself

Kenwood has just announced the world's smallest high frequency SSB transceiver, the new TS-50S. It's a dilly! I have been putting it through its paces, and this small powerhouse continues to impress me with all it can do. And just when you think you have exhausted its possibilities, there is a hidden menu of resetable parameters that you can play with for even more hours of enjoyment. This new miniature SSB, 100-watt output, all-band transceiver has now set the precedent for small, powerful, mobile HF gear.

But one of the most common comments I received from our students was: "No built-in automatic tuner?" Nope—it's so small, there is no room. With their IC-728, ICOM took the same approach—the automatic tuner will need to go on the outside of the equipment. And how Yaesu packed a built-in automatic tuner into their FT-890 is truly a work of art.

"But why do you need the tuner?" If you properly installed your mobile or home antenna system, you don't want to use a built-in automatic antenna tuner. You don't need to. A perfectly resonant mobile whip or multiband vertical or beam should work quite nicely on 10 meters, 12 meters, 15 meters, and 20 meters from the bottom of the band to the top of the band without requiring you to resort to a built-in automatic antenna tuner.

If you are running a rig with a built-in tuner into a perfectly resonant antenna system, you are probably wasting a few watts of power inside the tuner mechanism that could ordinarily go straight through and onto the antenna, where it does the most good. What the built-in automatic tuner is good for is operation on 40 meters, 80 meters, and 160 meters when you need to QSY up or down the band a few kilohertz and operate with a low SWR to the transceiver where your tuned antenna system is not precisely resonant. For instance, let's say you set your HF 75-meter whip tip for a perfect 1:1 match at 3910 kHz. Your friends wish to move up to 3950 kHz, and this is beyond the natural resonance of your antenna system. Here is where that built-in automatic tuner, or an AT unit on the side of your rig, will help.

But let's say you put up a new seven-band trap vertical, mounted very close to the second story of your home, and your ground radial system is a little cockeyed as it travels around the roof. Instead of checking where the antenna is naturally resonant, or grossly unresonant, you merely push the AT tune button, and bingo—your built-in SWR meter illustrates a perfect 1:1 match. But unfortunately, your signal isn't all that great, and you have TVI everywhere. You see, pushing the AT button on your transceiver doesn't isolate the SWR out of your feedline or correct a bad antenna installation—rather, it just lets the rig jam all those 100 watts into the feedline and the nonresonant antenna, and the whole thing radiates inside your house as well as a little bit outside. No wonder you have TVI, and you're probably putting more signal on the coax than you are the antenna, and that's why the bad signal report.

So if you do own a transceiver with a built-in antenna tuner unit, bypass the tuner, and perfect your resonant antenna system for the best match possible on the frequencies you normally use on HF. Then, if you wish to QSY up or down a few kilohertz from where your antenna is now perfectly resonant, things will work swell. But don't mask an otherwise bad antenna installation by simply kicking in the automatic tuner—you are putting a lot of RF energy right onto the coax inner and outer conductors, and this puts the coax right back in your shack and in your face. Not good.

Most built-in automatic antenna tuners will only resolve an SWR less than 3:1, or 20 to 150 ohms impedance. If you have a long wire installation, or random wire or sloper, or if you are working aboard a boat with an insulated backstay for the antenna, then you need to go to a completely different type of "AT," and these are called automatic antenna couplers. Only these antenna couplers, which are remote-mounted, can make up for impedances as low as a fraction of an ohm to as high as several thousand ohms. The coax is also "cold" in that the remote-mounted automatic antenna coupler does its thing at the very end of the feedline, not at the transceiver. This keeps RF out of your face, and out of your shack, and reduces TVI dramatically.

So don't worry about the new breed of small HF mobile transceivers that don't include the tuner inside of their tiny package. If you've installed your antenna system properly, you shouldn't need it, nor should you use built-in tuning capabilities. Consider the built-in tuners more as trimmers. That's the way they are supposed to work. RF

Photo B. Placing a mobile whip directly over a ground plane will provide a perfect 50 ohm match. Again, no tuner required!

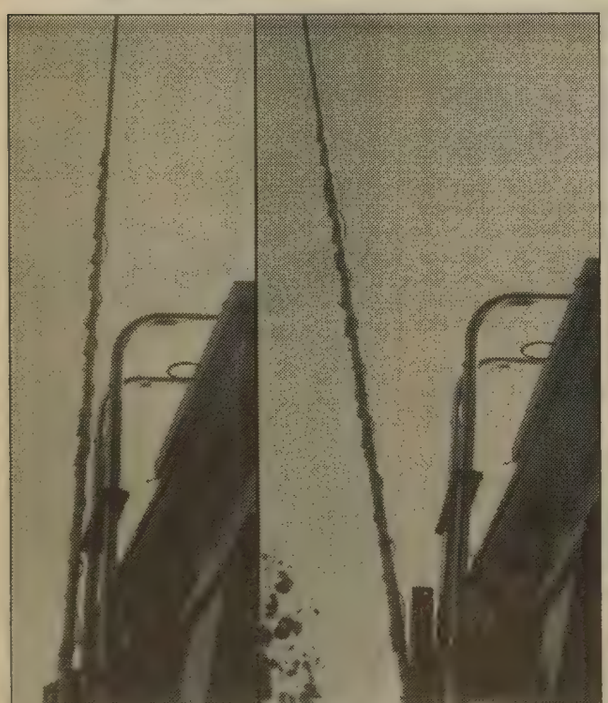


Photo A. Spacing the antenna *away* from the metal ground will help resolve high SWR without requiring a tuner. See above: left—wrong; right—correct.

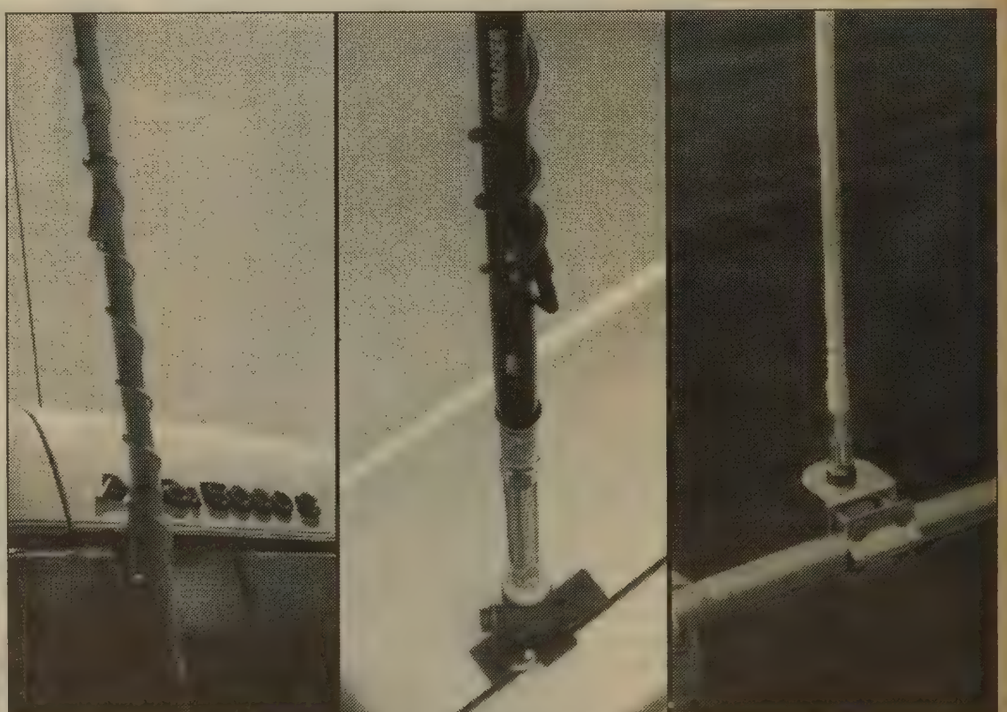


Photo C. Left: An antenna mounted too low won't achieve an SWR dip like the two installations shown in the middle and at the right. *Do not* use a tuner to correct a problem with your antenna mounting!

RF vintage review

ICOM IC-4A 440 MHz HT

by Walter R. Stringer N8BSG

Photo A. The IC-4A hand-held 440 MHz FM transceiver. (Photo by Michael D. Landis.)

I recently purchased an ICOM IC-4A 440 MHz hand-held FM transceiver because I wanted to get on the FM portion of the 3/4-meter band in the most cost-effective manner possible. I believe that I made a very good decision and if you'll read on I'll be glad to tell you why.

No Crystals

Activity on 440 is growing as more and more of the 2 meter FM crowd are getting one of the current crop of 70cm FM hand-held units (ICOM IC-4A, Yaesu FT-708R, Tempo S-4, Santec ST-440/up). Therefore, more repeaters are bound to appear.

The IC-4A offers 2,000 possible channels—the top 10 MHz of the 420 to 450 MHz band, in 5 kHz steps. The thumbwheel switches select the frequency in 1 MHz, 100 kHz, and 10 kHz steps, with the 5 kHz select switch just to the right of the thumbwheel switches. (The switch at the extreme right is not used by ICOM—it is there for you to wire up a switchable tone encoder.)

The antenna connector is a BNC type, and below it are external microphone and speaker jacks. To the right of the antenna connector is an LED which lights during transmit. It also serves as a battery indicator: If it goes out while you are squeezing the push-to-talk switch on the left side of the radio, your battery has just died. (You can, as soon as you notice the LED go out, immediately unkey, then key up again and say rapidly, "This is [your callsign]—clear," if this makes you feel better. You may even get through. If not, the next person in line will probably sign you out.)

On the back of the radio are three slide switches. The RF power switch, which is the top one, selects between 0.15 watts out in the low position and 1.5 watts out in the high position. In the low-power position, you draw only 43% of the current that you do in the high position, so you can transmit about twice as long. But remember that you're putting out only one-tenth the power. I do not consider this to be a good enough trade to warrant the use of the low-power position unless I am within spitting range of a repeater.

Below the power-select switch is a duplex/simplex select switch, and below that is a +5 MHz/-5 MHz transmit offset switch. Don't ask me why ICOM does not use a single three-position switch that has 5 down, simplex, and 5 up on it. My IC-4A does not have an out-of-band transmit-inhibit circuit in it since the HT will transmit from 435.000 MHz to 454.995 MHz when in the duplex mode.

The microphone is located on the front of the radio case to the bottom right of the speaker, just above the word "microphone" that is molded onto the case. I was so used to those CB-type handhelds, where the speaker is used as the microphone, that it took me awhile to realize that I was directing my voice into the wrong place. Talk into the lower-right corner of the speaker where there is a little rectangular slot cut into the case and you will get full audio quality.

The unit comes in a gray plastic case, lacks the bells and whistles that inhabit the fronts of other brands of HTs, and doesn't have as much shiny metal. To me, it looks more like a policeman's HT than a ham's playtoy.

Along with the radio you get the rubberized flexible antenna, a BP-3 battery pack and a wall charger for it, a metal belt clip and two screws with which to attach it to the radio, a hand strap (which I never use), an earphone (which I never use), and one each sub-mini plug and mini plug for the external mike and speaker jacks. You also get an instruction manual which gives a good general idea of what is going on, and two separate sheets which are quite detailed schematic and circuit board layouts. The size and appearance of the rig is identical to the IC-2A/AT, and except for antennas, they use the same accessories.

The radio will not scan unless you want to wear out your fingers on the thumbwheel switches, so you must own a programmable scanner or know the frequencies you will be using. Otherwise, you may need to get one of the band-scanning rigs instead of this one.

For some serious rag-chewing with this rig you need either a basketful of batteries or an AC-operated power supply. I have built a regulator circuit into a BP-4 battery pack case which allows me to use the car battery (via a cigarette lighter power adapter and a miniature plug) or my unregulated 13.8 VDC power supply at home. The schematic for the regulator is shown in Figure 1, and Photo B is a close-up of the finished product.

[Editor's Note: ICOM offered a pre-built regulator, model DC-1, that looked like a battery but had a coaxial power jack in the side for your I2V power supply. The DC-1 is often available on the used gear market.]

When I'm at home, I use an improvised quarter-wave ground-plane antenna that works quite a bit better than the rubberized whip antenna. It consists of a pizza pan (for the ground plane) with a hole in the center to hold an SO-239 jack (see Figure 2). I soldered a stiff copper wire to the top of the jack. A PL-259 plug with RG-58/U or RG-8/U cable is screwed onto the connector, and the length of the copper wire whip is trimmed to one-quarter wavelength or for lowest standing-wave ratio at your favorite frequency.

Unfortunately, I don't have a lot of sophisticated test gear, but I can tell you that 0.3 microvolts of signal will definitely quiet all the rushing noise in my receiver. The power with a fresh battery is somewhat higher than that stated in the manual, and most amazing of all (to me) is that all channels are stable, with very little frequency drift.

I got my IC-4A for just under $260 from my local ham radio store in December 1981, and for another twenty dollars or so I could have gotten the Touch-Tone pad version. RF

Reprinted from the July 1982 issue of 73 Magazine for Radio Amateurs.

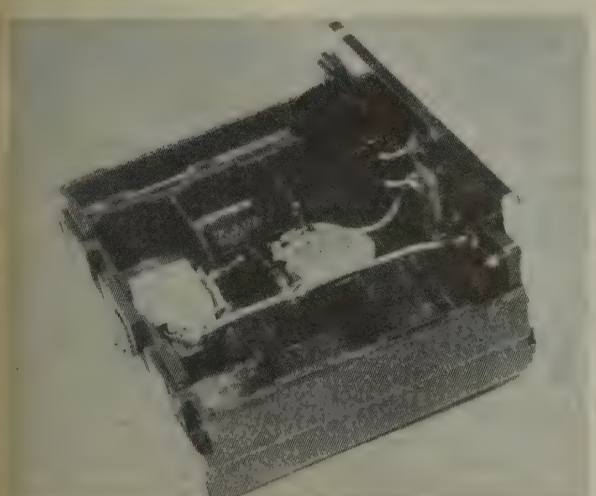


Photo B. The regulator circuit in the BP-4 case. (Photo by Michael D. Landis.)

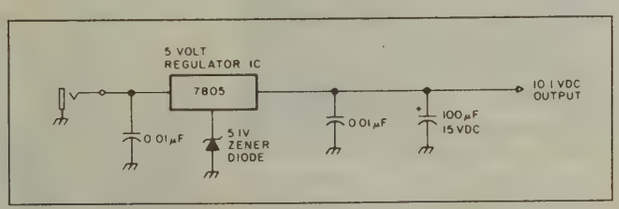


Figure 1. Regulator built into a BP-4 battery case.

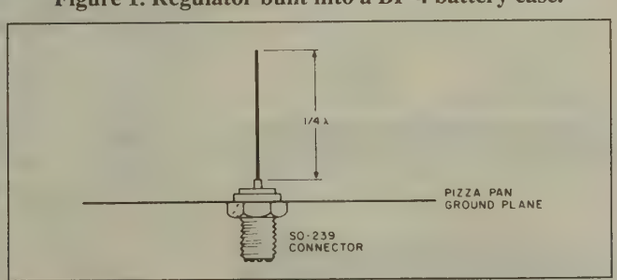


Figure 2. An improvised quarter-wave ground-plane antenna.

what's next?

by Carole Perry WB2MPG

Photo A. The kids enjoyed their follow-up activities, like sharing projects such as model building of shuttles.

Up, Up and Away!

What could be more exciting to a group of children than to talk with a real-life astronaut? By using amateur radio in the classroom I'm able to motivate students by contacting radio amateurs who happen to be astronauts. One of the nice things about our hobby and service is that it doesn't require fancy equipment or elaborate radio and antenna setups to be able to contact a king, a movie star or an astronaut.

Getting involved with the SAREX (Shuttle Amateur Radio Experiment) program in a school situation is an excellent opportunity for children to experience the thrill of a radio contact with an astronaut in space, right from their classroom. The important thing for teachers to realize is that even if they aren't one of the lucky schools to get picked for a SAREX contact, there are lots of highly motivational lessons about space travel and communications that they can incorporate into the school curricula.

On the "CQ All Schools" net that I run with Gordon West every Tuesday and Thursday at 17:30 UTC on 28.303 MHz, we've had the good fortune of contacting astronauts while they had their feet on the ground and their hands on a microphone as well. While speaking with the children on the air, the "astrohams" expressed the importance of pursuing a sound education and suggested considering a technical career. The children had the chance to ask questions that were queeries only kids could come up with. One of my favorites was, "How do you brush your teeth in space?" Astronaut Ron Parise WA4SIR described chasing the toothpaste across the cabin of the shuttle.

Each time one of these extraordinary contacts was over, we all sat quietly, just looking at each other. The children and I knew that something very special had happened. It's hard to describe the exact feeling in my room, but it was clear that every youngster felt very special and honored that an astronaut had taken the time to talk with them on the radio. As a teacher, I'm very aware of the importance of positive role models in the lives of children. My classes are very aware of the respect and admiration I have for the people in the space program. I think that today's astronauts are truly heroes who should be given the proper respect from society, especially by the young people.

The following are some of the best projects that the students created, collected, or researched. My eighth graders assembled a giant scrapbook of thoughtful puzzles and answers. For example:

Question: Spots on the sun go through repeating cycles of about 11 years. Their size and number vary irregularly from week to week, but on the average the time between periods when the spots are largest and most numerous is about 11 years. When this maximum period is reached, "magnetic storms" blow toward us from the sun. They cause the earth's northern and southern lights—the aurora borealis and aurora australis that shine in the night sky near the poles—to glow brighter than usual; and they play havoc with radio and other electronic communication.

One enormous sunspot seen in 1947 was 30 times the size of the earth's surface. Most sunspots are much smaller than that and last only a few days or weeks, though some last several months. Occasionally one will remain visible for a year or longer.

The sun has a weak magnetic field, with north and south magnetic poles like those on earth. What peculiar change happens to the sun's magnetic poles every 11 years when the sunspot cycle is at its maximum?

Answer: For some strange reason, the sun's magnetic poles do a complete flip-flop when the sunspot cycle is at its maximum. The north pole becomes south pole and vice versa. Because of this switching of poles, a full sunspot

cycle is said to last 22 years. For half that time the north pole is at one end of the axis of rotation and half that time it is at the other end.

Question: Two spaceships speed toward each other, one at 9,000 miles per hour, the other at 21,000 miles per hour. They start 15,537 miles apart in space. How far apart are they one minute before they pass each other?

Answer: The spaceships approach each other with a combined speed of 30,000 miles per hour, or 500 miles per minute. If you imagine the scene going backward in time, you can see that one minute before the ships pass each other they must be 500 miles apart. The distance of 15,537 miles apart at the beginning was added just to confuse you. It's not needed for the simple solution.

Amongst the most enjoyable and fun projects the kids did in class was "Famous Firsts." The students made a pictorial time line showing the Famous Firsts in our space program. I provided science textbooks and encyclopedias for the research part of the project. They had to find important dates in space history such as: launching of the first suborbital flight, first orbital flight in the U.S., first rendezvous in space, first manned flight around the moon, first men to land and walk on the moon, etc.

We used white butcher paper and magic markers to show the space "firsts." We then hung the time line across one wall of the classroom for all the children to add drawings or more information. The kids really loved getting involved with the "Space Line." Many of the students chose to fill in the more important achievements of the space travel program on the line as well. We plan to use this as a grade project next year for our school science fair.

Another interesting project we did was to make a list of all the people who work behind the scenes to get a space shuttle launched. This turned into a fascinating research project, including interviews, letter writing, and using ham radio contacts who offered assistance.

One of the best things about teaching school curricula via amateur radio is that I never run out of exciting, highly motivational material. The space program offers a myriad of possibilities to help make learning fun in the classroom.

For more information about how to get involved in the SAREX program, contact Rosalie White at the ARRL, 225 Main St., Newington CT 06111. RF

"I think that today's astronauts are truly heroes who should be given the proper respect from society, especially by the young people."

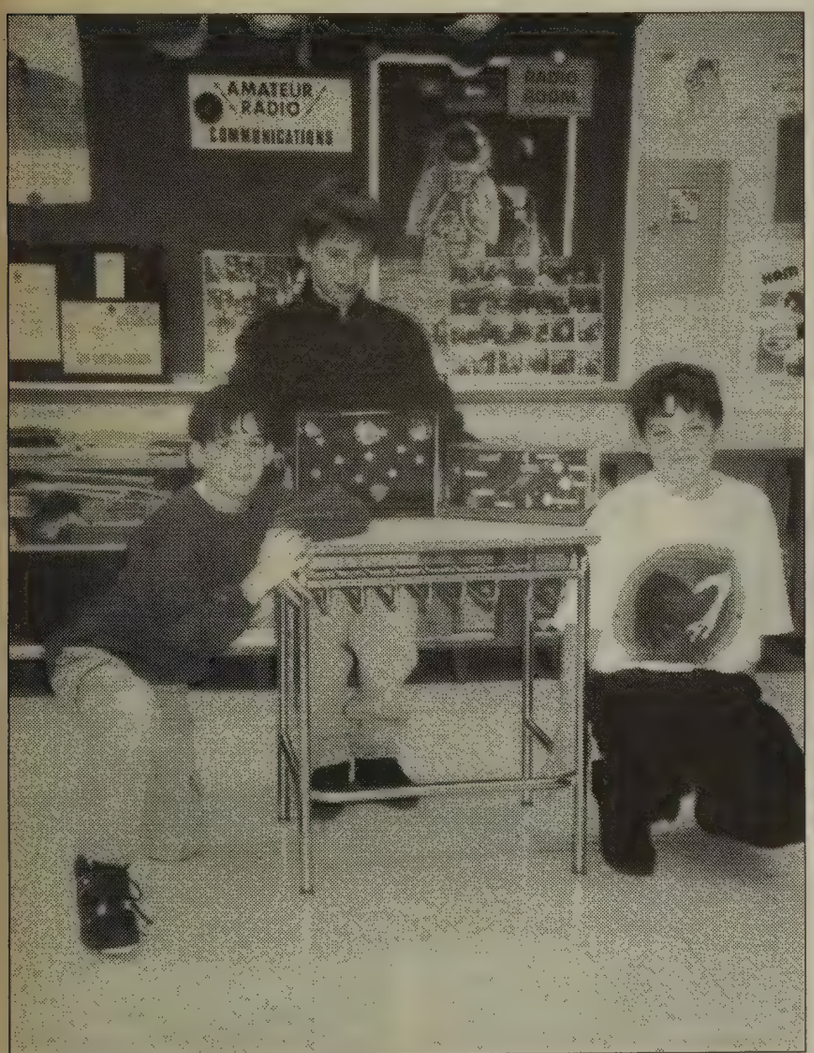


Photo B. Some of the kids made diaramas and puppet shows as a culminating activity to the astronaut contest.

radio magic

Continued from page 21

Checkout

Checkout is simple. But first, check over all the wire connections. Don't forget the ground wire if you're using a plastic box to house your project. If everything looks fine, then plug in your 9 volt battery. Plug in your CW paddle. Now, set your transmitter to CW and set the power control (RF drive) all the way down to zero output. You might want to connect up your dummy load to the antenna terminal too. (You do have a dummy load, don't you?)

Plug the transmitter's key line to the key out jack (the RCA jack). Nothing should happen. Now close one side of the CW paddle. The transmitter should key and its sidetone should be heard. If you're lucky, the dot paddle will be on the right side of the paddle (unless you're left-handed!). If not, then swap out the two wires on the 1/4 jack and try it again. If you have it correct, then solder them in place.

Adjust the speed control and verify the speed increases and decreases with the control. Remember, this is a simple keyer so don't expect perfect digital timing of the CW. It works and makes CW—nothing more, nothing less.

That's it! You're now on your way to high speed CW. With a bit of skill and some luck, you'll have a working keyer for just about nothing. But, the feeling that you get by building your own gear is priceless.

But what if nothing happens when you close the paddle? Well, that's were we'll pick up next month. I'll show you how to troubleshoot a digital circuit without access to an entire lab full of test gear. RF

Radio Fun flea market

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 30,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 25 cents a word for individual (non-commercial) ads, and 80 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad. This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

Send your ads and payment to *Radio Fun Flea Market*, Judy Walker, 70 Route 202 N, Peterborough NH 03458, and *get set for the phone calls.*

The Deadline for the July 1993 Flea Market is May 26, 1993.

NOVICE GEAR: HEATH SB-303 in excellent condition, asking $150.00; Nye-Viking handkey, never used, $25.00. Please call after 7 PM EST, (804)498-3894. RF235

SENSATIONAL NEW WAY TO LEARN CODE-Do Aerobics, Sing, Jog, or Drive while learning code! **Now** the secret is yours! Order **THE RHYTHM OF THE CODE-Morse** code music cassette today! $9.95 ppd **KAWA RECORDS**, P.O. Box 319-R, Weymouth MA 02188. Tune in 15.685 MHz Shortwave Sundays, 6 PM EST to hear The Rhythm of the Code on "Radio Techniques". RF247

MINIATURE POLICE RADAR TRANSMITTER one mile range, $41 assembled, $31 kit, (219)489-1711. P.O. Box 80096, Fort Wayne IN 46898. RF251

HOMEBREW COMPONENTS. Large SASE brings catalog. **KA7QJY COMPONENTS**, Box 3893, Logan UT 84323. RF271

WEATHER INSTRUMENTS. Digital and Traditional. Call for catalog. **THE WEATHER STATION.** (603)526-8390. RF280

INEXPENSIVE HAM EQUIPMENT. Send stamp for list. WA4DSO, 3037 Audrey Drive, Gastonia NC 28054. RF559

SECRET SCANNER Frequencies: Federal, Police, Aero, Military, Cellular, Surveillance, also SWL & CB Books. Big FREE catalog! **CRB RESEARCH**, Box 56-RF, Commack NY 11725. RF996

AMATEUR RADIO REPAIR!! All makes & models, average labor per unit, $96.00. **W7HBF, DAN RUPE,** 1302 S. Upland Dr., Camano WA 98292. (206)387-3558. RF999

activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

JUNE 5

NORWICH, CT The annual Ham Radio Auction sponsored by the Radio Society of Norwich, will be held from 10 AM until sold out, at the Waterford Senior Citizen Center, Waterford Municipal Complex. Bring your equipment to be auctioned. Talk-in on 146.07/.67 rptr. Contact *KA1BB at (203) 739-8016.*

SOUTH BURLINGTON, VT Come to the South Burlington Middle School on Dorset St., to enjoy the Northern Vermont Mid-Summer Hamfest. Time: 8 AM-3 PM. VE Exams at 2 PM. Talk-in on 145.47 (-600) or 146.85 (+/-600). Contact *Joe Tymecki N1DMP, (802) 893-6458* or *Mitch Stern WB2JSJ, (802) 879-6589.*

JUNE 6

CHELSEA, MI The Chelsea Swap & Shop, sponsored by the Chelsea ARC Inc., starts at 8 AM at the Chelsea Fairgrounds. Talk-in on 146.980-. Contact *Gary R. Widmayer N8AYY, P.O. Box 325, Manchester MI 48158. Tel. (313) 428-9398.*

MANASSAS, VA The Ole Virginia Hams ARC will sponsor the Manassas Hamfest/Computer Show at the Prince William County Fairgrounds. Open to the public at 8 AM. Talk-in on the Manassas rptr., 146.37/.97 and 223.06/224.66. Commercial vendors contact *Woody KD4DEG at (703) 368-5180.* For info, call *Mary Lou KB4EFP, (703) 369-2877.*

NEWINGTON, CT The annual Amateur Radio and Computer Flea Market, sponsored by the Newington AR League, will be held from 9 AM-2 PM at Newington High School. Guided tours of ARRL headquarters and W1AW. VE Exams (no walk-ins); SASE to *Susan Fredrickson WM1B, P.O. Box 165. Pleasant Valley CT 06063.* For info and Flea Market reservations, contact *Jim Carney KA1TAF, c/o NARL, 34 Meadow St., Newington CT 06111; Tel. (203) 673-0884;* (SASE for confirmation).

PRINCETON, IL The Starved Rock Radio Club Hamfest will be held at the Bureau County Fairgrounds, starting at 6 AM. Talk-in on 146.355/.955. Contact *Mark Tondi N9OVD, RR1 Box 34, Peru IL 61354. Tel. (815) 446-4342;* or *Nils Barto, Jr. N9PLJ, 2238 Schuyler Dr., Peru IL 61354. Tel. (815) 224-1299.*

JUNE 12

BANGOR, ME A Hamfest, sponsored by the Pine State ARC, will be held at the Hermon Elementary School from 8 AM-1 PM. Flea Market. VE Exams. Contact *Roger W. Dole KA1TKS, RR #2 Box 730, Bangor ME 04401. Tel. (207) 848-3846.*

LOVELAND, CO The Northern Colorado ARC will present "Superfest XV" at the Larmer County Fairgrounds, 700 S. Railroad. Open to the public at 8 AM. ARRL VEC Exams (call *Rick Hubbard WA0DDC, (303) 353-3577*). Talk-in on 144.515/145.115 and 146.25/.85. For table reservations, contact *Orlin Jenkins K0OJ, 2101 5th St., Greeley CO 80631; Tel. (303) 353-7094.* For details, contact *John Schmidt NK0R, 1001 King Dr., Loveland CO 80537; (303) 663-7581.*

MARMORA, ONT., CANADA Eastern Ontario Hamfest, sponsored by the Marmora ARC, will be held at 9 AM at the Marmora Curling Club. Talk-in on VE3TZW 145.41/144.81 rptr. Info and table contact: *Paul VE3UUM, (613) 472-3449.*

WINSTON-SALEM, NC The Winston-Salem Hamfest/Computer Fair will be held at Lawrence Joel Veterans' Coliseum Annex, 9 AM-5 PM. Talk-in on 146.04/.64. Send SASE to *B.J. Honeycutt, Winston-Salem Hamfest, P.O. Box 11361, Winston-Salem NC 27116. Tel. (919) 723-7388 (24 hrs).*

JUNE 13

DARIEN, NY The Lancaster New York Hamfest, sponsored by the Lancaster ARC, will be held at Darien Center Fire Co., on RT 77 at RT 20. Talk-in on 147.135 +.600, 146.550 simplex, and 443.850 +5. Contact *Nick WA2CJJ, 5645 Genesee St., Lancaster, NY 14086. (716) 681-6410;* or *Luke N2GDU, 1105 Ransom Rd., Lancaster NY 14086, (716) 683-8880.*

ERLANGER, KY The Northern Kentucky ARC will sponsor "Ham-O-Rama 93" at Erlanger Kentucky Lions Park. Doors open at 8 AM. Talk-in on 147.255+ or 147.375+ rptrs. For info, registration, contact *KC4FET c/o NKARC, P.O. Box 1062, Covington KY 41012. Tel. (606) 341-1213.*

GRANITE CITY, IL The Egyptian RC will conduct its annual EGYPTIANFEST at the club grounds on Chouteau Place Rd., from 6 AM-1 PM. VE Exams will be conducted at Sanford Brown Business College, 3237 W. Chain of Rocks Rd. Please contact *Eric Koch NF0Q, (314) 946-0948* for pre-registration. Talk-in on the ERC-W9AIU 146.76 rptr. For info, tickets, contact *Larry Walton NZ0P, at (314) 524-3254; 524 Heather, St. Ann MO 63042;* or *Bill Dusenbery N9OQK, at (618) 345-7587; 1260 St. Louis Rd., Collinsville IL 62234.*

STEVENS POINT, WI The Central Wisconsin Radio Amateurs, Ltd., will hold its 16th annual SWAPFEST at the University Center on the University of Wisconsin-Stevens Point campus, from 8 AM-1:30 PM. ARRL VEC Testing. Contact *Art Wysocki N9BCA, CWRA Swapfest Chairman, 3356 April Ln., Stevens Point WI 54481. Tel. (715) 344-2984.*

STOW, OH The Goodyear ARC will hold its 26th annual Hamfest and Family Picnic at Wingfoot Lake Park near Akron OH. Flea Market from 8 AM-4 PM. For tickets and info, contact *William F. Dunn W8IFM, 4730 Nottingham Ln., Stow OH 44224. Tel. (216) 673-8502.*

WILLOW SPRINGS, IL Come join the fun at Santa Fe Park, 91st and Wolf Rd., where the Six Meter Club of Chicago, Inc. will hold its 36th annual Hamfest. Gates open at 6 AM. Talk-in K9ONA 146.52, or K9ONA 146.37/.97 rptr. Order advance tickets from *Mike Corbett K9ENZ, 606 South Fenton Ave., Romeoville IL 60441*, or any club member. Dealers: For pavillion reservations, contact *Joseph Gutwein WA9RIJ, 7109 Blackburn Ave., Downers Grove IL 60516. Tel. (708) 963-4922.*

JUNE 19

CORTLAND, NY The Skyline ARC will hold their 11th annual Cortland Internat'l Hamfest at the Cortland County Fairgrounds from 7 AM-3 PM. VE Exams by reservation only. Talk-in on 147.780/.180. Dealers contact *S.A.R.C., P.O. Box 5241, Cortland NY 13045. Tel. (607) 756-6550 eves. or weekends.*

GRANDVIEW, MO The Dixie ATV Soc. will sponsor the Dixie ATV Hamfest from 8 AM-3 PM at the Grandview Middle School, 12650 Manchester. Talk-in on 144.34 MHz simplex. VE Exams. Contact *Steve Carroll WV0J, 200 Monroe, Belton MO 64012. Tel. (816) 322-4429.*

MIDLAND, MI The 19th annual Midland Hamfest, sponsored by the Midland ARC, will be held at the Midland Community Center, George St. at Jefferson, from 8 AM-1 PM. VE Exams, walk-ins okay. Talk-in on Midland 147.00+. Contact *Bill N8LTR at (517) 832-3053* for info. Send reservation payments to *MARC Hamfest, P.O. Box 1049, Midland MI 48640.*

JUNE 19-20

BURBANK, ALBERTA, CANADA The Burbank Campground will be the site of the 22nd annual Picnic sponsored by the Central Alberta Radio League. Sat. June 19th: Golf Tournament at 0730 hrs; Barbecue Dinner at 1800 hrs.; Flea Market. Sun. June 20th: Pancake Breakfast at 0800-1000 hrs. Many other events. Contact *Blair Heinzlmeir VE6BJH, (403) 343-1655.* Talk-in on 147.150 +0.600 MHz, or 146.520 simplex.

JUNE 20

CAMBRIDGE, MA The MIT Radio Soc. and the Harvard Wireless Club will hold their TAILGATE Electronics/Computer/Amateur Radio FLEA MARKET at Albany and Main Sts., from 9 AM-2 PM. Talk-in on 146.52 and 449.725 - pl 2A - W1XM rptr. Call *(617) 253-3776* for details.

FREDERICK, MD The Frederick ARC will hold its annual Hamfest at the Walkersville Firemen's Carnival Grounds from 8 AM-4 PM. Talk-in on 147.06/+, 146.52, and 448.425/-. For info, write to *Frederick Hamfest, P.O. Box 1260, Frederick MD 21702.*

MONROE, MI The Monroe County Radio Communications Assn. will sponsor the Monroe Hamfest at the Monroe County Fair Grounds, M-50 at Rasinville Rd., from 8 AM-2:30 PM. VE Exams by pre-registration only. Contact *Fred E. Lux WD8ITZ, 5742 Parkside Dr., Monroe MI 48161. Tel. (313) 243-1053.*

SANTA MARIA, CA The Satellite ARC will hold its annual Santa Maria Swapfest at the Union Oil Picnic Grounds. Gates open at 9 AM. Dinner served at 1 PM. Talk-in on WB6IIY/R 146.34/.94. Call *Rick Laird KB5OO, (805) 937-8337,* or write to *Santa Maria Swapfest, P.O. Box 2067, Orcutt CA 93457.*

JUNE 24-27

VICTORIA, B.C., CANADA The Friendship ARS of Victoria will sponsor the 3rd Internat'l Friendship Radiosport Games and Hamfest. Talk-in on 146.84 rptr., or 147.42 simplex. Contacts: *Tel., (604) 370-4420; FAX, (604) 370-3750; Packet, VE7KPV @ VE7VBB.#ISLAND.BC.CAN.NOAM.*

JULY 3

LEHMAN, PA Come to the Luzerne County Fair Grounds, Route 118, to enjoy the 14th annual Wilkes-Barre/Murgas ARC Hamfest and Computerfest. Gates open at 5 AM. Talk-in on 53.61, 53.81, 146.52, 146.61, 449.825 PL82.5 Hz. For details, call *KA3A, (717) 824-5724 days; (717) 825-3940 eves.* For tables, contact *K3SAE - KB3GB, RD#1, Box 214, Pittston PA 18643. Tel. (717) 388-6863.*

JULY 4

HARRISBURG, PA A Hamfest, sponsored by the Harrisburg RAC, will be held from 8 AM-2 PM at the Bressler Picnic Grounds. Talk-in on 6.76/R or 52/52. Reservations contact: *Steve Gobat KA3PDQ, (717) 938-6943.*

SPECIAL EVENT STATIONS

JUNE 12

WALLINGFORD, CT Grand Lodge A.F. & A.M. of CT amateurs will operate WT1R 1300Z-2100Z at the Masonic Home and Hospital, to celebrate Grandmaster's Day. Operation will be in the lower General portion of the 80-10 meter bands. For QSL, send SASE to *Bruce Backer, Box 5028, New Haven CT 06525.*

JUNE 15-18

LONDON, ONT., CANADA The London ARC will operate CJ3-LON from a hot air ballon on one of the following evenings: June 15, 16, 17, or 18; and the morning of June 19th, to celebrate the 200th Birthday of London, Ontario. Frequencies: 146.52, 446.00 simplex, and FSTV 439.25 TX only. For commemorative QSL, send QSL and SASE to *Anthony Drawmer VE3-SQU, 55 Briscoe St West, London N6J-1M4 Ontario, Canada.*

JUNE 18-20 and 25-27

WASECA, MN June 1993 marks the 70th year that E.F. Johnson Co. has manufactured radio and electronic components. To celebrate this historic event, the Viking ARS will operate a SE Station using Edgar Johnson's original callsign, 9ALD. If it is unavailable, WA0CJU, the club call of the Viking ARS, will be used for the duration of the event. Operation will take place on all non-WARC bands from 160-10 meters using a mixture of AM, SSB, and CW. Send an 8 x 11 SASE for a QSL card and special certificate, or a letter size SASE for the QSL card. For more details, call the *24-hour-hot-line, (507) 835-6612.* Send requests to *E.F. Johnson Co., ATTN: 70th Anniversary Special Event Station, P.O. Box 1249, Waseca MN 56093.*

JUNE 19

SPIVEYS CORNER, NC Triangle East ARA will operate AC4QD 0300Z-1200Z, to celebrate the 25th annual Nat'l Hollerin' Contest. Frequencies: CW 7.135 and 21.405; Phone 28.335 and 14.260. To get a certificate, send QSL and SASE to *TEARA, 209 N. Third St., Smithfield NC 27577.*

YUMA, AZ The Yuma ARC will operate a Special Event Station in commemoration of the 50th Anniversary of the US Army Yuma Proving Ground. Operations will be in the 15 and 20 meter General, and 10 meter Novice phone subbands, from 1500Z-2400Z. For a certificate, send QSL and a 9 x 12 SASE to *Operator CBA or YARC, P.O. Box 7077, Yuma AZ 85366.*

JUNE 19-20

ARCADE, NY The Pioneer Radio Operators Soc. (PROS) will operate W2CRY from the Curriers, NY Railway Station, to celebrate the one millionth passenger carried by the Arcade and Attica Steam Railroad. Operation will be in the General SSB/CW 10, 15, 20, 40, and 75 meter bands with 2 meter "railmobile" operation on 145.390 MHz rptr. SASE to *W2CRY, 9765 S. Protection Rd., Holland NY 14080,* for a special QSL.

Uncle Wayne's Bookshelf

BOOKS FOR BEGINNERS

02D42 **Digital Novice** *by Jim Grubbs* Geared to make you a more knowledgable participant. **$8.50**

01A87 **Shortwave Listener's Antenna Handbook** Primer antenna theory. **$13.95**

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05E50 **Fun Way Into Electronics** Exciting build and learn projects. **$9.95**

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20N018 **Technician Class License Manual: New No-Code** *by Gordon West* This book covers everything you need to become a Technician Class Ham. Every question and answer on the examinations is found in this one book. FCC Form 610 application. **$9.95**

20N092 **The Wonderful World of Ham Radio** *by Richard Skolnik, KB4LCS* Simple, clear, and fun. Introduces young people to amateur radio. **$7.95**

20N100 **Electronics Build and Learn (2nd Ed.)** *by RA Penfold* Combines theory and practice so that you can "learn by doing." **$12.50**

20N099 **Digital Electronics Projects for Beginners** *by Owen Bishop* Contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. **$12.50**

AR2073 **Novice Antenna Notebook** A beginners guide to easy and effective antennas and tuners you can build. **$9.50**

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06S57 **1993 Passport to World Band Radio** *by International Broadcasting Services, Ltd* You'll get the latest station and time grids. **$16.50**

03S11 **Shortwave Receivers Past and Present** *edited by Fred J. Osterman* Guide to 200+ shortwave receivers manufactured in the last 20 years. The Blue Book of shortwave radio value. **$8.95**

07R25 **The RTTY Listener** *by Fred Osterman* New and expanded. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter.* Contains up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. **$19.95**

03C09 **Shortwave Clandestine Confidential** *by Gerry L. Dexter* Covers all clandestine broadcasting, country-by-country: tells frequencies, other unpublished information: spy, insurgents, freedom fighters, rebel, anarchist radio, secret radio. **$8.50**

03M221 **US Military Communications (Part 1)** US Military communication channels on shortwave. Covers frequencies, background on point-to-point frequencies for the Philippines, Japan and Korea, Indian and Pacific Oceans, and more. **$12.95**

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03M223 **US Military Communications (Part 3)** Completes the vast overall frequency list of US Military services, from 8993 KC to 27,944 KC. **$12.95**

09S42 **The Scanner Listener's Handbook** *by Edward Soomre N2BFF* Get the most out of your scanner radio. **$14.95**

03S208 **Radioteletype Press Broadcasts** *by Michael Schaay* Schedules of Press Services by time, frequency, and country broadcasting in English, French, German, Spanish, and Portuguese. **$12.95**

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03K205 **Guide to Radioteletype (RTTY) Stations** *by J. Klingenfuss* Updated book covers all RTTY stations from 3MHz-30MHz. Press, Military, Commercial, Meteo, PTTs, embassies, and more. **$12.95**

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11RF13 **The "Top Secret" Registry of US Govern-ment Radio Frequencies (7th Ed.)** *by Tom Kneitel K2AES* This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. **$19.95**

11F52 **Ferrell's Confidential Frequency List, New Revised Edition** *compiled by A.G. Halligey* All frequencies from 4 MHz-28MHz covering ship, embassy, areo, Volmet, Interpol, numbers, Air Force One/Two, more. **$19.50**

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11SM11 **Scanner Modification Handbook, Vol. 1** *by Bill Creek* provides straightforward step-by-step instructions for expanding the operating capabilities of VHF scanners. **$17.95**

11EE06 **Guide to Embassy Espionage Com-munications** *by Tom Kneitel K2AES* Candid and probing examination of worldwide embassy and (alleged) espionage communications systems and networks. **$10.95**

15D93 **1993 Shortwave Directory (8th Ed.)** *by Bob Grove* Extensively revised, the new 1993 Shortwave Directory is the consummate DXer's bible for the first 30 MHz of radio spectrum, including up-to-date and accurate. **$21.95**

20N093 **Vintage Radio 1887–1929** *by Morgan E. McMahon* The authoritative reference book for historians and collectors. **$8.95**

20N094 **A Flick of the Switch, 1930-1950** *by Morgan E. McMahon* Discover the fast-growing hobby of radio collecting. **$8.95**

07R26 **World Wide Aeronautical Communications** *by Robert E. Evans* Aircraft/Air Traffic Control, Aircraft/Company Operations, Aviation Weather Broadcasts, Aeronautical Flight Tests, Worldwide Military Air Forces, Aero Search & Rescue, Aero Law Enforcement, NASA Flight Support, Aero Terms & Abbreviations and Aero Tactical Identifiers. **$6.95**

11T89 **Scanner Modification Handbook Vol. 2** *by Bill Creek* Here it is—a companion to Vol. I. In fact, Vol. 2 has a section that provides improved approaches and updated techniques for the mods in Vol. 1. There's 18 new exciting modifications for popular scanners. **$17.95**

03R01 **World Press Services Frequencies (RTTY) New 5th Ed** A comprehensive manual covering radioteletype news monitoring—contains all information—antenna, receiving, terminal units, plus three extensive frequency lists. **$8.95**

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05H24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. **$29.50**

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12E76 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Covers the important aspects of applied electronics and electronics communications. **$10.95**

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01D45 **The Illustrated Dictionary of Electronics, 5th Ed** *by Rufus P. Turner and Stan Gibilisco* An exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables. **$26.95**

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IBM06, COM06 IBM/Commodore Tech No Code—Lanze Code Program Contains all the authorized FCC questions and answers used in testing formulas, schematic symbols, diagrams, and sample test for passing the new Technician No Code license. **$24.95**

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RF0693

new products

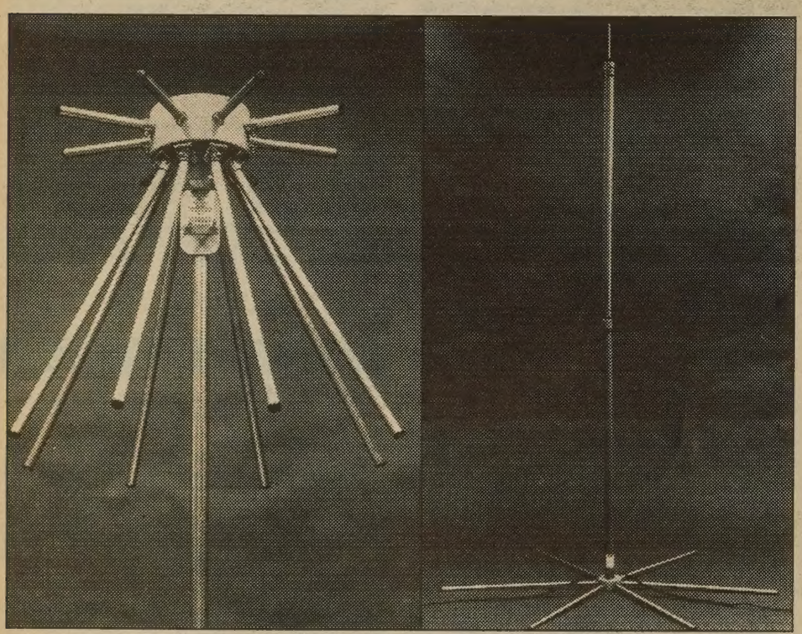
HEIL SOUND LTD.

The SA-1 (left) from Heil Sound, a new compact sound system for amateur radio receivers, will allow operators to hear weak signals like never before, sort out the rare ones, and hear audio quality never available before from amateur radio receivers, handie talkies or scanners. It contains a high quality 5 watt amplifier, a 4" broadband speaker working into a ported cavity. A variable equalization circuit is built into the amplifier, allowing the operator to adjust the tonality of the received audio for maximum articulation. The extended response, added efficiency and additional power output from the SA-1 will lower your noise floor, increase articulation and allow you to copy signals that used to be impossible to hear.

The new PRO-SET (right), also from Heil Sound, is one of a continuing line of products developed by and for the amateur radio market. The unique qualities of this headset/microphone makes it particularly useful for multi-op contesting and DXpeditions. It has an adapter type cable to facilitate the dozens of connector pinouts for various rigs. There are three different PRO-SET models, with differences in the type of microphone element used. The vinyl earpad ring mount snaps into the headpiece for easy removal for washing or replacement. The headband is fully padded, with detent stops for each side. The unit is light but extremely rugged. The microphone boom is flexible and can be placed in just about any location, as well as folded up for traveling and storage.

The estimated retail price for the SA-1 is $89.95; $134.95 for the PRO-SET. For more information, contact *Heil Sound Ltd., Heil Drive, Marissa IL 62257; (618) 295-3000, Fax: (618) 295-3030.* Or circle Reader Service No. 201 for the SA-1; Reader Service No. 202 for the PRO-SET.

FLYTECRAFT



FLYTECRAFT has introduced two new antenna models, the Model CFN and the SFX line. The Model CFN (left) is a 16-element, wideband VHF/UHF antenna designed for amateur radio operators or scanner enthusiasts, and for all frequencies from 50 through 1300 MHz. It provides a solid low angle of radiation or reception with a low SWR across the spectrum (less than 1.7 to 1 with unity gain). The Model CFN is designed for both indoor and outdoor use, and for permanent or portable use (to assemble, you simply insert the elements and tighten the screws).

The SFX line of monoband vertical antennas (right) comes in five different versions for 40, 30, 20, 15 and 10 meters. These antennas are only nine feet high (the 10 meter model is seven feet) and are designed to sit on a patio, lawn or balcony. They can be set up or taken down in just a couple of minutes, and they are unobtrusive enough for antenna-restricted locations.

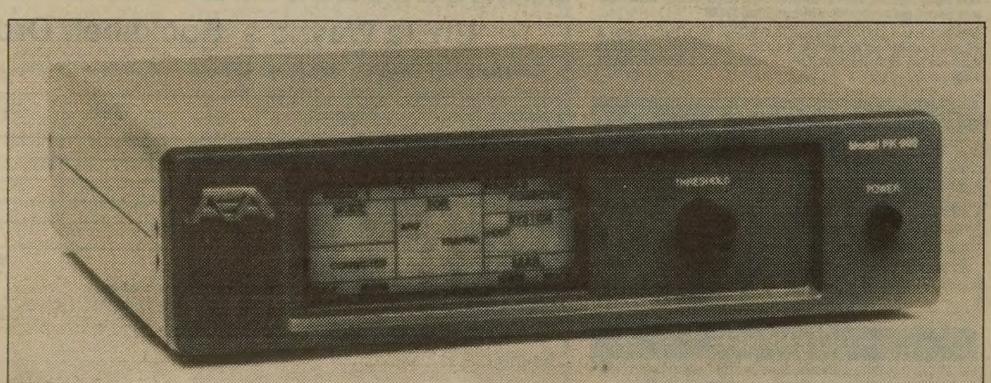
The CFN is $119.95 (plus $5.50 S&H); the SFX 40, 30, 20 and 15 are $99.95 each and the SFX 10 is $89.95 (plus $6.50 S&H per antenna). For more information, contact *FLYTECRAFT, P.O. Box 3141, Simi Valley CA 93093; (805) 583-8173, (800) 456-1273.* Or circle Reader Service No. 207.

UNIVERSAL RADIO

The self-contained M-400 from Universal Radio is a sophisticated decoder *and* tone reader offering an exceptional range of capabilities. No computer or monitor is required. The sloped front and two-line, 40-character LCD makes it easy to read. The shortwave listener will be able to decode Baudot, SITOR A&B, FEC-A, ASCII and SWED-ARQ. Weather FAX can also be decoded to the printer port. The VHF-UHF listener will be able to copy the ACARS VHF aviation teletype mode plus GOLAY and POCSAG digital pager modes. Off-the-air decoding of DTMF, CTCSS (PL) and DCS is also supported. The M-400 can even be programmed to pass only the audio you want to hear, based on CTCSS, DCS or DTMF codes of your choosing. It can run from 12 VDC or with the supplied wall adapter. It is American-made of all metal construction, and comes with a one-year limited warranty.

For the price and more information, contact *Universal Radio, 6830 Americana Pkwy., Reynoldsburg OH 43068; (614) 866-4267, (800) 431-3939.* Or circle reader Service No. 206.

AEA



AEA has introduced its latest multimode data controller, the PK-900, with a powerful triple processor system. It provides all standard amateur digital modes, dual simultaneous ports, a PACTOR option, a large back-lit display, a 9600 bps G3RUH/K9NG plug-in option board, a Direct Digital Synthesis AFSK tone generator, six selectable receive modem tone pairs (from 170 Hz to 1000 Hz), packet and AMTOR Maildrop, and 16 gray-shade WEFAX (with optional software).

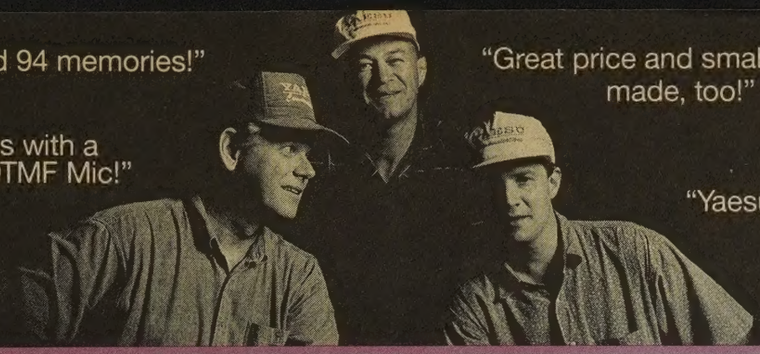
AEA has also introduced PC-Pakratt for Windows, the only data controller program for Microsoft Windows on the market today. AEA's latest addition provides a true Windows application for controlling its entire family of data controllers, the new PK-900, DSP-1232 and DSP-2232, as well as the industry-standard PK-232 and PK-88 controllers. PC-Pakratt works under Windows 3.1 and can run two AEA controllers simultaneously. It includes all the features of standard control programs, such as split-screen operation, on-screen status, file transfers, macros, QSO logging, on-screen parameter lists and much more.

The suggested list price for the PK-900 is $549. For the price of PC-Pakratt for Windows and more information, contact *Advanced Electronic Applications, P.O. Box C2160, 2006 196th St. SW, Lynnwood WA 98036; (206) 774-5554, (800) 432-8873.* Or circle Reader Service No. 204 for the PK-900; Reader Service No. 205 for PC-Pakratt for Windows.

SENSIBLE SOFTWARE SOLUTIONS

CopyCode from Sensible Software Solutions is a Morse code trainer for the Amiga computer that can be used to upgrade your amateur radio license. All controls—including frequency, volume, weight, character formation and transmission speeds, lesson length, and hide/show text—may be set by using a mouse. CopyCode contains all the characters on the FCC exam, and more. You can practice with the 14 predefined character groups or create your own groups using a unique on-screen keyboard. CopyCode contains thousands of random but repeatable sequences of characters, words, Q-signals, CW abbreviations and QSOs. You can also run multiple copies of CopyCode to practice receiving CW through QRM.

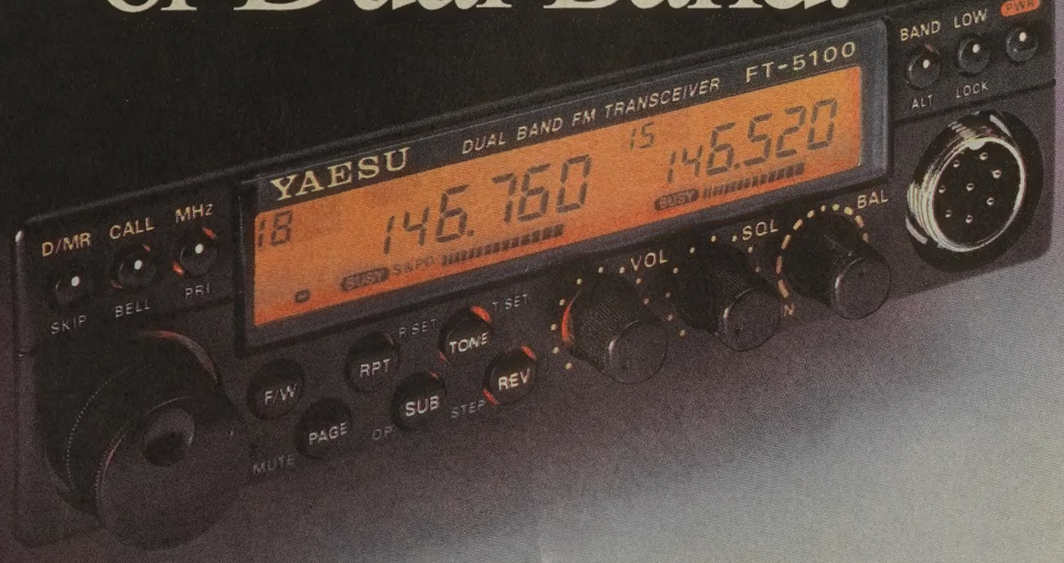
CopyCode is priced at $23. For more information, contact *Sensible Software Solutions, 4951-D Clairemont Square, Suite 262, San Diego CA 92117-2798; (619) 452-1938.* Or circle Reader Service No. 203.



FT-5100
Dual Band Mobile

- **Frequency Coverage:**
  2M: 130-174 MHz RX
  140-150 MHz TX
  70 cm: 430-450 MHz RX/TX
- 94 Memories (47 per band) Odd Splits In Any Memory
- Dual in-band receive (V/V, U/U or V/U Receive Operation)
- DTMF Paging and Coded Squelch Included.
- Packet Radio TNC Jack Built-In To Back of Radio
- CTCSS Encode Built-In
- Dual Receive with Balance Control
- Full Duplex Cross Band Operation
- Built-In Antenna Duplexer
- Back Lit DTMF Microphone
- Automatic 8 Level Display Dimmer
- Built-In Cross Band Repeat
- RF Output Power:
  2M: 50/5 watt (high/low)
  70 cm: 35/5 watt (high/low)
- **Accessories:**
  FTS-22 CTCSS Dual Decoder
  SP-7 External Speaker
  MW-1 Wireless Microphone/ Controller

The ultimate definition of Dual Band.



Now you can listen to two, 2 meter frequencies, or two, UHF frequencies, at the same time with In-Band Dual Receive*. Although equipped with traditional dual band, Yaesu has taken receive two steps beyond in the remarkable FT-5100. Combined in one compact mobile transceiver, it's the ultimate meaning of "dual band".

With 94 memory channels – more than any other radio in it's class – and the optional MW-1 Wireless Mic, the flexibility of the FT-5100 is matchless. But to make sure the FT-5100 is complete, and an even better value, unlike the competition, there's a backlit DTMF mic included.

Through advanced miniaturization technology you'll find practical additions like the built-in antenna duplexer – an option on similar transceivers – and equally important, DTMF paging and coded squelch. All in the smallest dual band made!

Priced for the shrewd buyer, you've got to hear it to believe it. Dual band re-defined. Combinations like this can't be found anyplace else, so contact your nearest Yaesu dealer and tell him you want the "ultimate dual band". The FT-5100.

In-Band Dual Receive available only on FT-5100.

Three Dual Receive Configurations

VHF/UHF

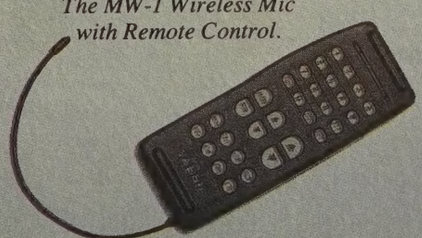
UHF/UHF

VHF/VHF

Dual band redefined.
And the choice is yours.

In-Band Dual Receive available only on FT-5100.

Here's another Yaesu exclusive!. The MW-1 Wireless Mic with Remote Control.



FT-5200. For those who don't want in-band dual receive, choose the security of the FT-5200 with it's quick-release front control panel (*not available on the FT-5100*). Comes with back-lit DTMF mic and built-in antenna duplexer.

YAESU

*Performance without compromise.*SM

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"OVER" is Out!

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ICOM's 1993 product line is going to be one innovation after another. To keep up with the breakthroughs, you'll need the ***I-COM LINE:*** your hotline for new radio info. Use it *now* for the latest on the W21AT, featuring dazzling duplex operation!

The NEW! *I-COM LINE*

Telephone Based Information!

Our I-COM LINE is free information, it's fun, and it's the best way ever to make intelligent radio buying decisions.

Here's all you do:

1. Dial **1-206-450-6088**

2. Leave your name, address, and the name of the product you're interested in – in this case, the W21AT.

Within 24 hours, we'll send you REAL info about the W21AT: how and why it was designed, spec sheets, field tests, reviews – everything you need to decide if this is the radio for you.

Give it a try! See how easy it is to communicate with the world leader in amateur radio communications.

I-COM LINE: *uniquely* ICOM!

(also available: the IC-W21A, without the DTMF pad).

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Telephone Style Innovation!

Full-duplex operation has always been possible, but not very practical.

ICOM's changed all that. The W21AT is the *first and only* handheld to give you full duplex that works like a telephone.

"Over" is over!

We added a second microphone, unique electronics, and wrapped it in the sleekest body ever. The W21AT *looks* as good as it performs.

We added Single Band Dual Receive (receive 2 signals on the same band simultaneously), and Cross Band Repeat (receive a signal on one band, retransmit it on another).

And "smart" memory for easy recall of preset functions.

And automatic sensing that matches output power to incoming signal strength to extend your on-air time. And more!

How much more? Call the I-COM LINE!

The IC-W21AT: *uniquely* ICOM!

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